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INTEGRATED ENVIRONMENTAL MONITORING STATUS REPORT FOR FIRST QUARTER 1999

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

INFORMATION ONLY

JUNE 1999

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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FINAL

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES
(Continued)

LIST OF TABLES

LIST OF ACRONYMS

AMS	air monitoring station
AMSL	above mean sea level
AWWT	Advanced Wastewater Treatment Facility
BTV	benchmark toxicity value
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FFCA	Federal Facilities Compliance Agreement
FRL	final remediation level
gpm	gallons per minute
IEMP	Integrated Environmental Monitoring Plan
lbs	pounds
M gal	million gallons
mrem	millirem
NESHAP	National Emissions Standards for Hazardous Air Pollutant
NPDES	National Pollutant Discharge Elimination System
OEPA	Ohio Environmental Protection Agency
OMMP	Operations and Maintenance Master Plan
OSDF	on-site disposal facility
pCi/L	picoCuries per liter
pCi/m^3	picoCuries per cubic meter
RCRA	Resource Conservation and Recovery Act
TLD	thermoluminescent dosimeter
WPRAP	Waste Pits Remedial Action Project
$\mu g/L$	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter

1.0 GROUNDWATER MONITORING UPDATE

1.1 INTRODUCTION

This section summarizes the first quarter 1999 operational data for the aquifer remedy. The fourth quarter 1998 analytical data from groundwater monitoring, including project-specific on-site disposal facility data, were reported in the 1998 Integrated Site Environmental Report (DOE 1999a) issued June 1, 1999, and are therefore not included in this report. This section is consistent with the groundwater reporting requirements presented in the Integrated Environmental Monitoring Plan (IEMP), Revision 1, (DOE 1999b) groundwater monitoring program.

Figure 1-1 shows the sampling activities that contributed data to this section. Figure 1-2 identifies the IEMP groundwater monitoring wells by module/monitoring activity and Figure 1-3 shows the IEMP routine water-level (groundwater elevation) monitoring wells. Figure 1-4 shows the location of the active aquifer restoration modules and extraction/re-injection wells.

1.2 FINDINGS

The principal findings from the reporting period are summarized below:

Operational Summary

- The South Field (Phase I) Extraction Module continued to operate during the first quarter of 1999. The module target pumping rate for the combined nine active extraction wells was 1500 gallons per minute (gpm). Table 1-1 provides operational details for this module. Figures 1-5 through 1-13 present daily pumping rates and operational percentages for each well and additionally identify well outages lasting longer than 24 hours. Since Extraction Well 31566 was not pumping during this quarter, there is no daily pumping rate figure. Figure 1-14 provides the weekly total uranium concentrations for each extraction well in this module.

  All active extraction wells in the module were pumped for the majority of the period at or above the rates specified in the Baseline Remedial Strategy Report, Remedial Design for Aquifer Restoration (Task 1) (DOE 1997a). All except Extraction Well 32276 were shut down from January 13 to January 14, 1999. In addition, Extraction Wells 31550, 31560, 31561, 31564, 31565, and 31567 remained off through January 21, 1999. As discussed during the January weekly site conference calls with the U.S. Environmental Protection Agency (EPA) and the Ohio Environmental Protection Agency (OEPA), these shut downs were part of an effort to mitigate high total uranium concentrations experienced at the Parshall Flume (refer to Section 2 for additional details).

As identified in the 1998 Integrated Site Environmental Report, unusually high average total uranium results were observed in Extraction Well 31566 in November and December 1998. This trend continued in January 1999, with 29.2 micrograms per liter (μg/L) of total uranium (refer to Table 1-1). However, the subsequent weekly process control samples (refer to Figure 1-14) and the next months' average results (8.8 μg/L for February and 7.7 μg/L for March) were much lower (refer to Table 1-1). Total uranium concentrations at this well will continue to be monitored, reported quarterly, and trended to determine if there is a need to resume pumping of this well.

- The South Plume Module (formerly known as the South Plume/South Plume Optimization Module) continued to operate during the first quarter of 1999. The six wells were pumped for the majority of the period at the rates specified in the Baseline Remedial Strategy Report. The South Plume Module target pumping rate was 2000 gpm. Table 1-2 provides operational details for the South Plume Module. Figures 1-15 through 1-20 present daily pumping rates and operational percentages for each well. Figure 1-21 depicts the weekly average total uranium concentrations for each well in this module.

  South Plume Extraction Wells 32308 and 32309 were shut down from January 9 to January 20, 1999, as part of the effort to mitigate the high uranium concentration in the Parshall Flume.

- The Re-Injection Demonstration Module continued to operate during the first quarter of 1999. The target re-injection rate for this module was 1000 gpm. Other than Re-Injection Well 22108, which was re-injecting around 150 gpm instead of 200 gpm (due to a malfunction of the 200 gpm pipe) groundwater was re-injected through five wells at the rates specified in the Baseline Remedial Strategy Report for the majority of the period. The re-injection wells were shut down from January 10 to January 20, 1999, as part of the effort to mitigate the high uranium concentration in the Parshall Flume. Table 1-3 provides operational details for this module and Figures 1-22 through 1-26 present daily re-injection rates and operational percentages for each well.

- Table 1-4 summarizes the operational data from the three active restoration modules for the first quarter of 1999. The South Plume and South Field (Phase I) Extraction Modules pumped a total of 414 million gallons of groundwater and removed 179 pounds of total uranium during this reporting period. The Re-Injection Demonstration Module re-injected 101 million gallons of groundwater back into the aquifer for a net total extraction of 313 million gallons. To date, 4.35 billion gallons of groundwater have been pumped and 993 pounds of total uranium have been removed from the aquifer. Figure 1-27 depicts the total groundwater pumped versus groundwater treated during the first quarter. Figure 1-28 shows the removal efficiencies for the South Field (Phase I) Extraction and South Plume Modules.

- The hours in the reporting period for daily average pumping and re-injection rates for extraction and re-injection wells vary slightly from one figure to another because flow rate readings are taken each eight hour shift but not always at exactly the same time each day.

Total Uranium Plume

- Although no uranium plume map for the first quarter is provided in this report, the following items are worth mentioning:

  - As identified in the Integrated Environmental Monitoring Status Report for Fourth Quarter 1998 (DOE 1998c) in support of the Re-Injection Demonstration, a third round of total uranium plume profile data were collected in late December 1998 and in January 1999 using a Geoprobe® at locations 12369C, 12372C, and 12373C. Although the fourth quarter status report indicated that this data would be reported in this quarterly report, these data, including cross sections, will not be available until the Integrated Environmental Monitoring Status Report for Second Quarter 1999. A fourth round of sampling was conducted in March 1999.

  - As identified in the 1998 Integrated Site Environmental Report, Monitoring Well 2648 showed an increase in total uranium concentration from 48.4 μg/L in fourth quarter 1997 to 57.3 μg/L in fourth quarter 1998. It was determined in early 1999 that surface water runoff was periodically entering the well and may have contributed to the increased total uranium concentration. This was caused by excavations and regrading activities around the well which in turn caused the top of the well to be below grade. The well casing was raised and the well was redeveloped in January and February of 1999. Total uranium concentrations in this well will continue to be monitored and reported in future IEMP quarterly status reports to assess the impact on the aquifer.

Groundwater Elevation Data and Capture Assessment

- Routine groundwater elevations for the first quarter of 1999 were collected in January and the contours derived from the elevations are shown in Figures 1-29 and 1-30 for the Type 2 and Type 3 monitoring wells, respectively. Figures 1-31 and 1-32 present detailed maps around the active restoration modules in the South Plume for the Type 2 and Type 3 monitoring wells, respectively. All the water elevation maps indicate that, with the exception of a very small portion of the northeastern lobe, the entire southern uranium plume is within the capture zone produced by the active aquifer restoration modules.

- Groundwater flow direction measurements were taken in three areas with the colloidal borescope during the first quarter of 1999: south of the South Plume Module, west of the South Plume Module, and in the area of the northeastern lobe of the total uranium plume. These measurements, as provided in Table 1-5 and illustrated in Figure 1-33, were obtained from February 8 through March 30, 1999, when the Re-Injection Demonstration, South Field (Phase I) Extraction, and South Plume Modules were operational. In the future, the U.S. Department of Energy (DOE) will better coordinate the collection of borescope flow direction data and water level data to help ensure that both data sets are representative of similar aquifer conditioning.

- Capture to the south of the South Plume extraction wells and west of the South Plume is being interpreted with water level data collected from January 25 through January 27, 1999, and borescope flow direction data collected from February 8 through March 30, 1999. During both time periods, pumping conditions in the South Plume Module were the same, so it is assumed that both data sets are representative of similar aquifer conditions.

  The water level data supplemented with the borescope flow direction data indicate that capture of the southern and western edges of the 20 μg/L total uranium plume was being achieved during the first quarter of 1999.

- Capture in the area of the northeastern lobe is being interpreted with water level measurements collected from January 25 through January 27, 1999, and borescope flow direction measurements collected from March 26 through March 30, 1999. During both time periods, pumping conditions in the South Plume and South Field (Phase 1) Extraction Modules were the same. Re-injection conditions, with the exception of Re-Injection Well 22108, were also the same. From January 25 through January 27, 1999, Re-Injection Well 22108 was operating at a rate of 150 gpm. From March 26 through March 30, 1999, Re-Injection Well 22108 was operating at a rate of 200 gpm. It is assumed, that except for the immediate area around Re-Injection Well 22108, that both data sets are representative of similar aquifer conditions.

  The water level data supplemented with the borescope flow direction data indicate that the eastern extent of capture in the South Plume area was located slightly west of Monitoring Wells 2898, 2093, and 21063 and slightly east of Monitoring Well 22303 during the first quarter of 1999. Based on this interpretation, it appears that most of the northeastern lobe was being captured during the first quarter of 1999.

  It is possible that the extreme southeastern tip of the lobe was not being captured; however, based on total uranium concentrations from Monitoring Well 21063, this does not appear to be the case. Monitoring Well 21063 is located in front of the southeast edge of the northeastern lobe. If the northeastern lobe was not being captured, the total uranium concentration at this well should be increasing; however, data collected from Monitoring Well 21063 indicates that the total uranium concentrations are not increasing (refer to Figure A.2-129 of the 1998 Integrated Site Environmental Report).

- Figure 1-34 shows the predicted steady state groundwater elevations from the groundwater model with the South Field (Phase 1) Extraction, Re-Injection Demonstration, and South Plume Modules operating as specified in the Baseline Remedial Strategy Report. The 10-year, uranium-based restoration footprint (capture zone) and the fourth quarter 1998 total uranium plume outline are also shown in the figure along with the interpreted capture zones from the January 1999 Type 2 groundwater elevation map. As shown in the figure, the modeled capture zone, which shows the maximum extent of the combined capture zones, is in close agreement with

the interpreted capture zones from each module; the 20 μg/L total uranium plume is within both the interpreted and modeled capture zones.

- As discussed in previous IEMP quarterly status reports, groundwater flow directions inferred from elevation measurements agree with predicted flow directions from the groundwater model except in the area of the northeastern lobe of the total uranium plume. This discrepancy between observed and predicted groundwater flow directions is being addressed with the groundwater model upgrade project. In the second quarter of 1999, Phase II of this upgrade received startup approval. When the VAM3DF groundwater model is available, this portion of the model will be re-calibrated to bring model predictions more in line with observed flow.

On-Site Disposal Facility Sampling

Status for Cells 1, 2, and 3:

- Sampling continues to be conducted as specified in the On-Site Disposal Facility Groundwater/Leak Detection and Leachate Monitoring Plan (DOE 1997b). The results from fourth quarter samples appeared in the 1998 Integrated Site Environmental Report. Figure 1-35 identifies the well locations.

- Volume from the leachate collection systems for the first quarter of 1999 are as follows: January (1,347,152 gallons); February (434,432 gallons); and March (548,077 gallons). In the 1998 Integrated Site Environmental Report, it was identified that the leachate pipeline was malfunctioning. Due to malfunctions of the leachate pipeline, the contingency plan for pumping of the leachate was implemented on February 2, 1999. This plan consists of pumping the leachate into tanker trucks, then hauling it to the lift station of the permanent leachate line, where it is then pumped to site water treatment facilities. The contingency plan continued for the remainder of the first quarter and into the second quarter of 1999 as required repairs to the leachate pipeline were identified and implemented.

- Volumes pumped from the leak detection systems, by cell, for the first quarter of 1999 are as follows: January (Cell 1: 211 gallons; Cell 2: 2560 gallons). No water was pumped from the leak detection system for Cells 1 and 2 during February and March due to the above noted shutdown of the leachate pipeline.

Figure 1-36 shows the data from the groundwater monitoring activities that will be included in the next IEMP quarterly status report. This next quarterly status report will be submitted in September 1999. The report will contain operational data and the plume capture assessment from April through June 1999 (second quarter), and analytical results from sampling activities conducted from January through March 1999 (first quarter).

TABLE 1-1

SOUTH FIELD (PHASE 1) EXTRACTION MODULE OPERATIONAL SUMMARY SHEET FOR FIRST QUARTER (JANUARY THROUGH MARCH 1999)

Extraction Well	31565	31564	31566[a]	31563	31567	31550	31560	31561	31562	32276
	Baseline Remedial Strategy Report Target Pumping Rates (gpm)									
	200	200	200	200	100	100	100	100	100	200
	Monthly Average Well Pumping Rates (gpm)									
January	144	141	0	160	71	70	63	70	151	277
February	185	189	0	190	96	100	99	95	189	277
March	189	196	0	193	100	100	99	100	198	292
Quarterly Average	173	175	0	181	89	90	87	88	179	282
	Monthly Average Well Concentrations for Total Uranium (µg/L)									
January	12.6	14.9	29.2	36.3	38.9	65.2	118.2	40.0	108.3	180.7
February	16.4	16.8	8.8	37.2	41.2	73.9	124.4	41.3	111.2	180.7
March	13.0	13.3	7.7	32.8	36.5	74.7	115.4	42.8	106.5	175.0
Quarterly Average	14.0	15.0	15.2	35.4	38.9	71.3	119.3	41.4	108.7	178.8
	Monthly Average Well Efficiencies (Pounds of Total Uranium Removed/Million Gallons Pumped)									
January	0.11	0.12	NA[c]	0.30	0.32	0.54	0.99	0.33	0.90	1.51
February	0.14	0.14	NA[c]	0.31	0.34	0.62	1.04	0.34	0.93	1.51
March	0.11	0.11	NA[c]	0.27	0.30	0.62	0.96	0.36	0.89	1.46
Quarterly Average	0.12	0.12	NA[c]	0.29	0.32	0.59	1.00	0.34	0.91	1.49

	Monthly Average Module Pumping Rate (gpm)	Water Pumped by Extraction Module (M gal)	Monthly Total Uranium Concentration from Extraction Module[b] (µg/L)
January	1147	51.20	81.7
February	1420	57.26	78.8
March	1467	65.50	75.3
Quarterly Average	1345	Total 173.96	Quarterly Average 78.6

[a]Extraction Well 31566 was shut down on August 7, 1998, and remained off through first quarter 1999.
[b]Average is calculated from individual well concentrations and flow rates.
[c]NA = not applicable

TABLE 1-2

SOUTH PLUME MODULE
OPERATIONAL SUMMARY SHEET FOR FIRST QUARTER
(JANUARY THROUGH MARCH 1999)

Extraction Well	3924	3925	3926	3927	32308	32309
	Baseline Remedial Strategy Report Target Pumping Rates (gpm)					
	300	300	400	400	250	250
	Monthly Average Well Pumping Rates (gpm)					
January	299	296	382	493	112	105
February	297	289	393	478	245	245
March	297	295	395	483	242	228
Quarterly Average	298	293	390	485	200	193
	Monthly Average Well Concentrations for Total Uranium (μg/L)					
January	50.0	32.5	19.9	1.2	63.0	81.4
February	48.5	36.1	23.7	1.2	70.4	73.2
March	37.2	35.3	19.9	1.7	71.0	72.8
Quarterly Average	45.2	34.6	21.2	1.4	68.1	75.8
	Monthly Average Well Efficiencies (Pounds of Total Uranium Removed/Million Gallons Pumped)					
January	0.42	0.27	0.17	0.01	0.53	0.68
February	0.40	0.30	0.20	0.01	0.59	0.61
March	0.31	0.29	0.17	0.01	0.59	0.61
Quarterly Average	0.38	0.29	0.18	0.01	0.57	0.63

	Monthly Average Module Pumping Rate (gpm)	Water Pumped by Extraction Module (M gal)	Monthly Total Uranium Concentration from Extraction Module[a] (μg/L)
January	1687	75.30	28.7
February	1948	78.53	35.9
March	1940	86.58	33.0
Quarterly Average	1858	Total 240.41	Quarterly Average 32.5

[a]Average is calculated from individual well concentrations and flow rates.

TABLE 1-3

RE-INJECTION DEMONSTRATION MODULE OPERATIONAL SUMMARY SHEET FOR FIRST QUARTER (JANUARY THROUGH MARCH 1999)

Re-Injection Well	22107	22108	22109	22240	22111
	Baseline Remedial Strategy Report Target Re-Injection Rates (gpm)				
	200	200	200	200	200
	Monthly Average Well Re-Injection Rates (gpm)				
January	126	109	123	131	127
February	175	144	189	188	189
March	164	133	182	180	182
Quarterly Average	155	129	165	166	166

	Monthly Average Module Re-Injection Rate (gpm)	Water Re-Injected by Module (M gal)
January	615	27.47
February	884	35.65
March	842	37.57
Quarterly Average/Total	780	100.69

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TABLE 1-4

AQUIFER RESTORATION SYSTEM
OPERATIONAL SUMMARY SHEET FOR FIRST QUARTER
(JANUARY THROUGH MARCH 1999)

	Gallons Pumped/Re-Injected this Reporting Period (M gal)	Total Uranium Removed this Reporting Period[a] (lbs)	Average System Efficiency this Reporting Period[a] (lbs/M gal)	Gallons Pumped/Re-Injected from August 1993 to March 1999 (M gal)	Total Uranium Removed from August 1993 to March 1999[a] (lbs)	System Efficiency from August 1993 to March 1999[a] (lbs/M gal)
South Field (Phase 1) Extraction Module	173.96	113.71	0.65	527.659	353.44	0.67
South Plume Module	240.41	65.36	0.27	3,823.744	639.97	0.17
Re-Injection Demonstration Module	100.69	NA	NA	251.581	NA	NA
Aquifer Restoration System Totals						
(pumped)	414.37	179.07	0.43	4,351.403	993.41	0.23
(re-injected)	100.69	NA	NA	251.581	NA	NA
(net)	313.68	179.07	NA	4,099.822	993.41	NA

[a]NA = not applicable

TABLE 1-5

FLOW DIRECTION DATA FROM BORESCOPE OBSERVATIONS FOR FIRST QUARTER 1999

Monitoring Well	Date of Observation	Feet Below Water Level	Average Flow Direction[a,b] (degrees)	Standard Deviation[b] (degrees)
2093	3/29	5.17	169.5	50.9
21063	3/30	35.13	121.6	35.1
22303	3/26	3.28	215.9	74.9
2551	3/30	6.53	78.3	55.0
2552	3/25	10.80	105.3	29.5
3552	3/26	66.38	15.7	90.5
2898	2/9	1.60	110.5	7.4
3898	2/8	65.41	84.0	21.4
2899	2/10	3.16	99.4	10.4
3899	2/10	66.68	22.9	25.5
2900	2/11	6.16	330.4	21.3
3900	2/16	69.37	341.8	86.5

[a]Average flow direction is measured clockwise in degrees from magnetic north.
[b]Values are calculated after statistical filtering to remove outliers.

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FIGURE 1-1

GROUNDWATER SAMPLING ACTIVITIES COVERED IN THIS QUARTERLY REPORT

SAMPLING ACTIVITIES	1999											
	First Quarter			Second Quarter			Third Quarter			Fourth Quarter		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
South Plume Module: Operational Aquifer Conditions	♦	♦	♦									
South Field Extraction Module: Operational (Phase 1) Aquifer Conditions	♦	♦	♦									
Re-Injection Demonstration Module[a]: Operational	♦	♦	♦									
Waste Storage Area Module: Aquifer Conditions												
Plant 6 Area Module: Aquifer Conditions												
Routine Water-Level/Flow Direction Monitoring	♦											
RCRA Property Boundary Monitoring												
Private Well Monitoring												
EC-2 Warehouse Monitoring												
OSDF Groundwater Monitoring: Cell 1 Cell 2 Cell 3												

♦ Data summarized/evaluated in this report

[a]Aquifer conditions for this module are monitored under the South Plume Module, South Field Module, RCRA Property Boundary Program, and Geoprobe® sampling results.

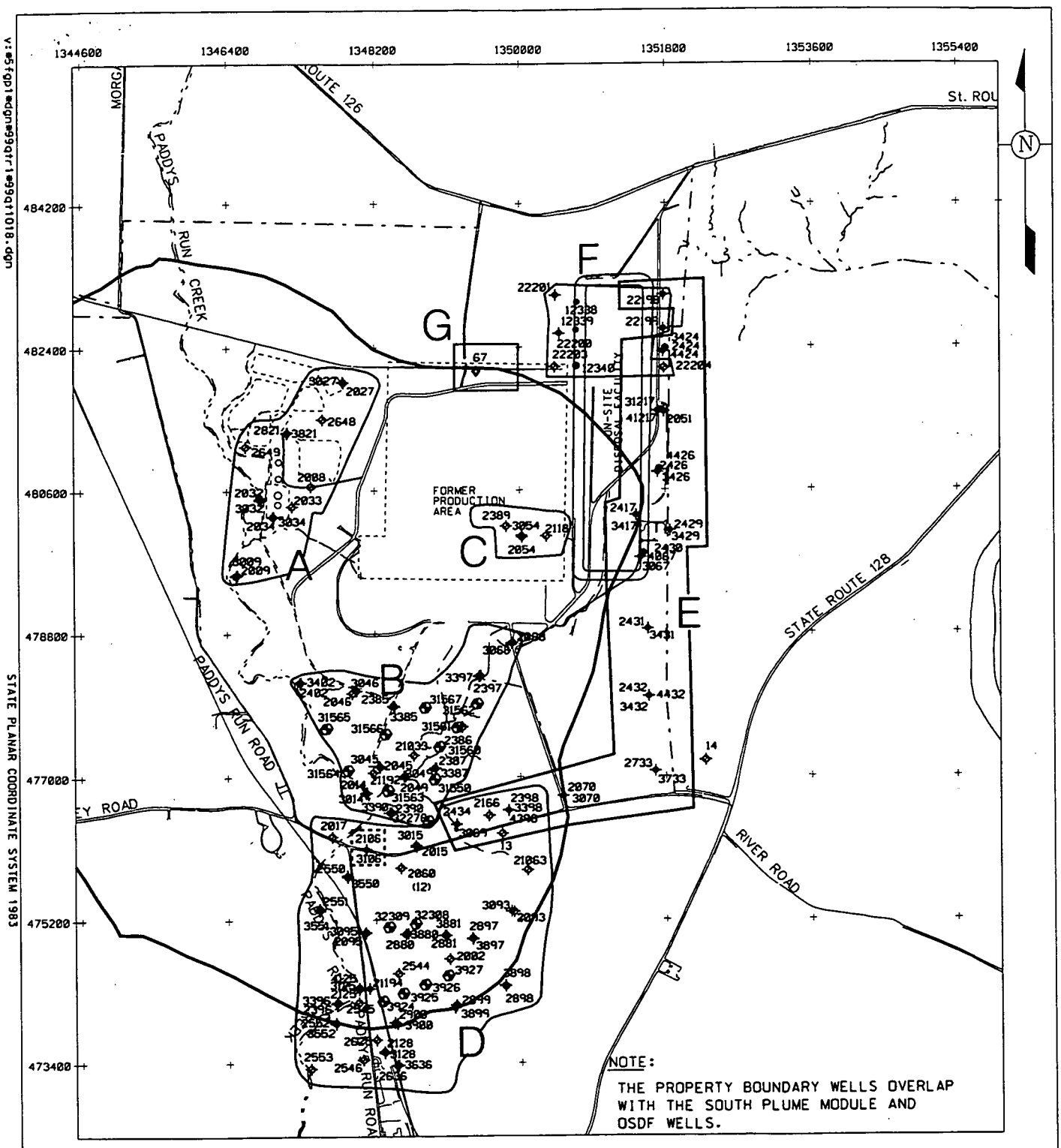

FIGURE 1-2. IEMP WATER QUALITY MONITORING WELLS AND EXTRACTION WELLS

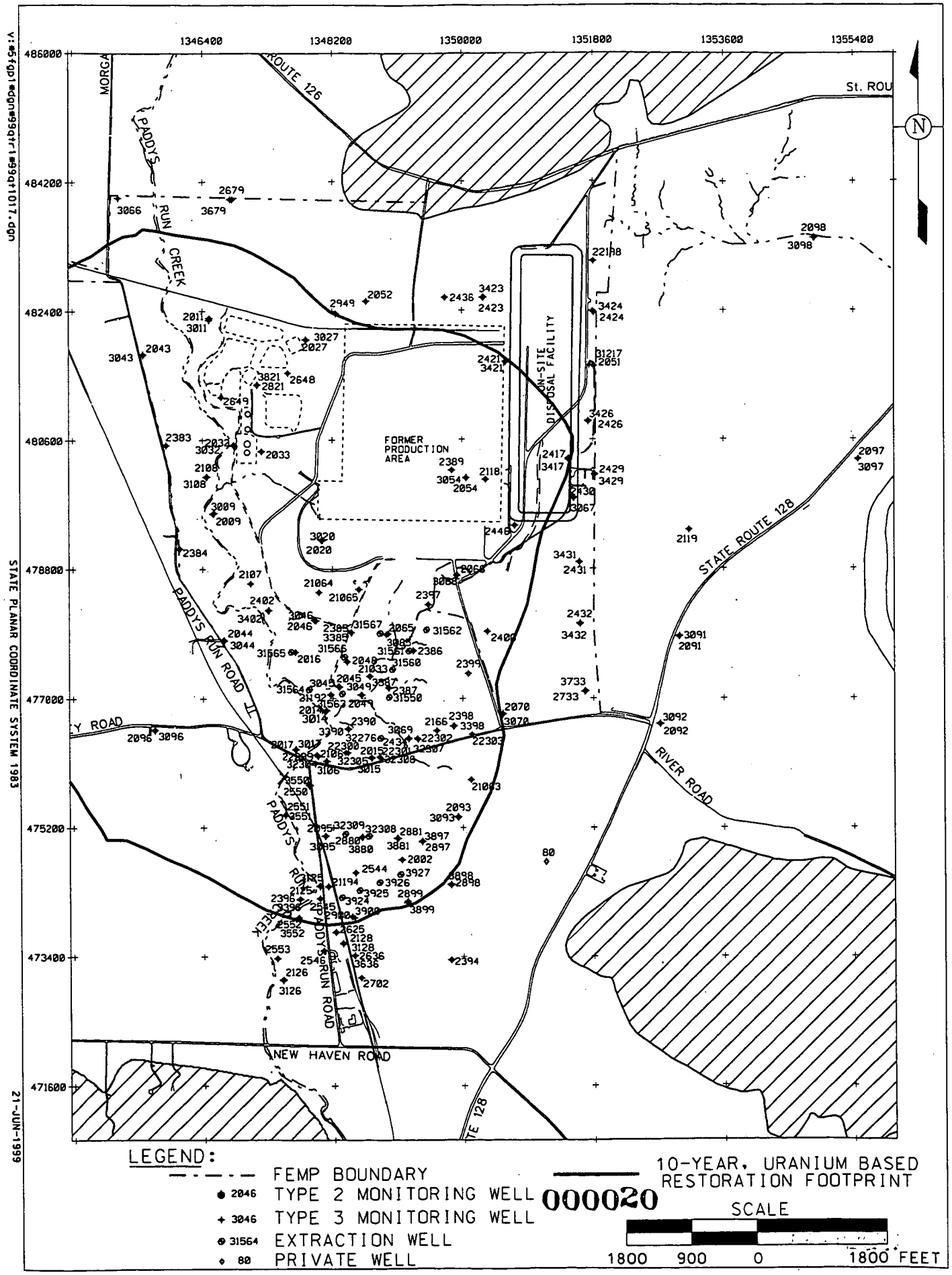

FIGURE 1-3. GROUNDWATER ELEVATION MONITORING WELLS

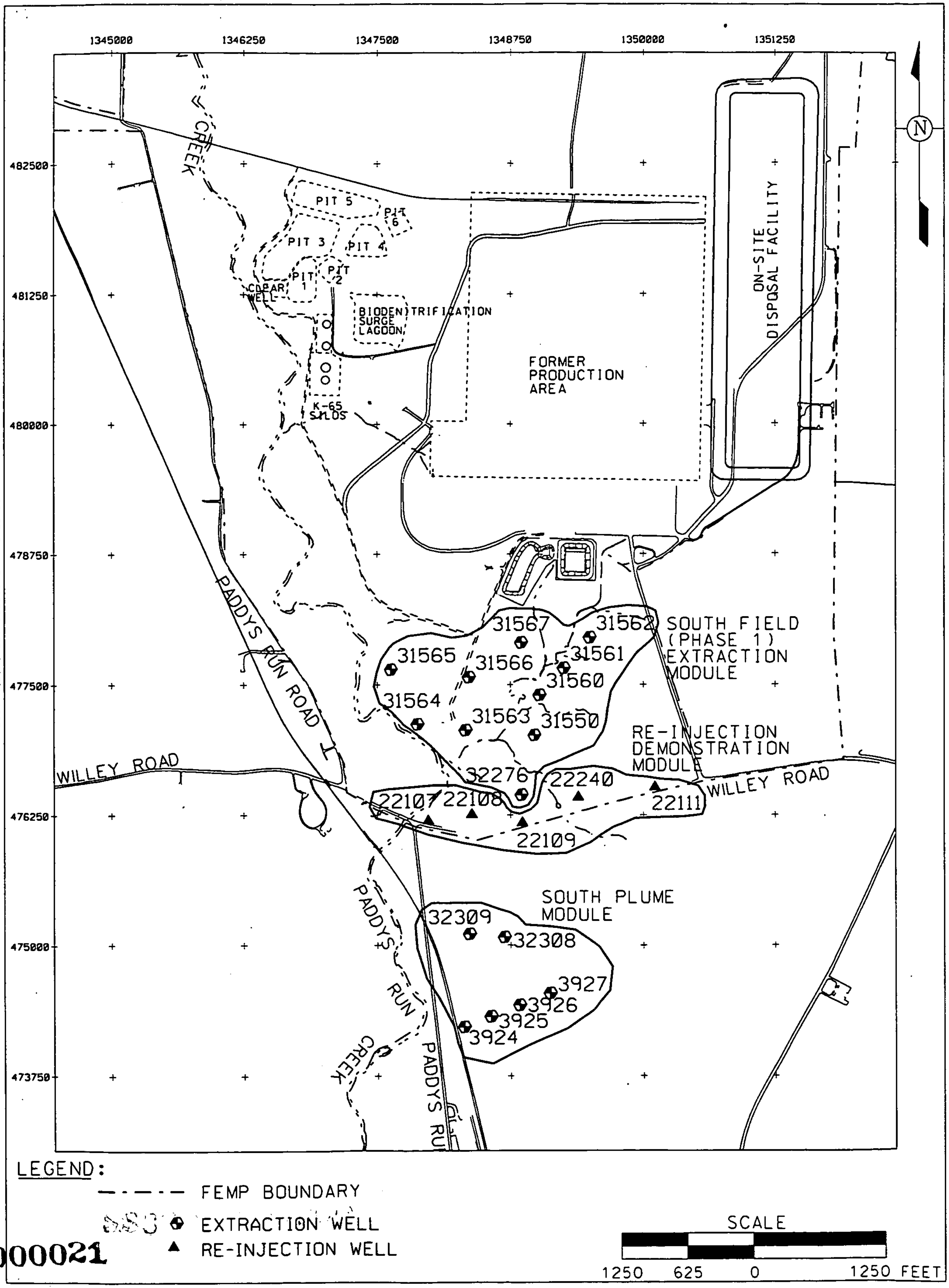

FIGURE 1-4. LOCATION OF ACTIVE AQUIFER RESTORATION MODULES

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STATE PLANAR COORDINATE SYSTEM 1983

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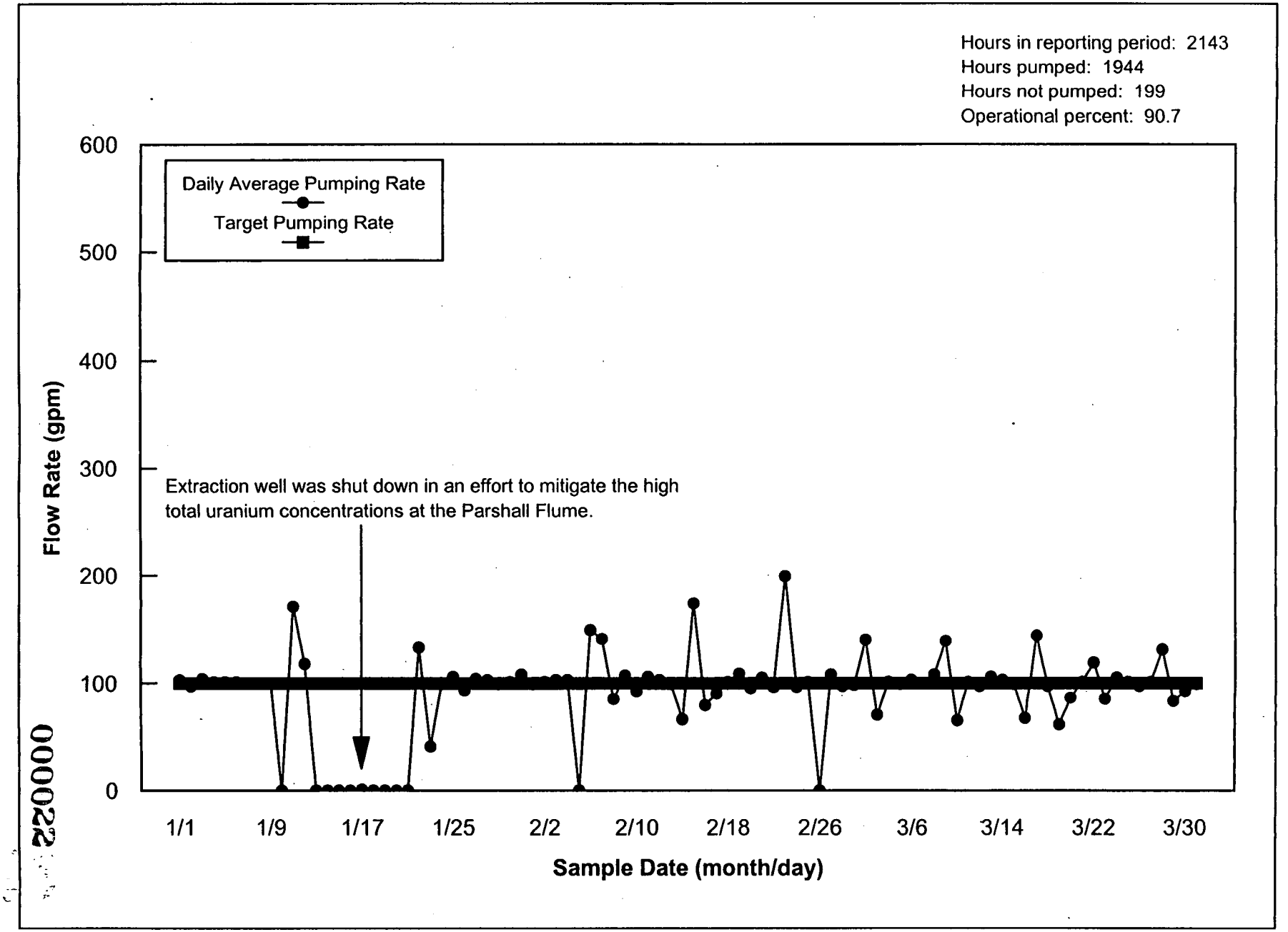

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FIGURE 1-5. DAILY AVERAGE PUMPING RATES FOR SOUTH FIELD (PHASE 1) EXTRACTION WELL 31550, 1/99 - 3/99

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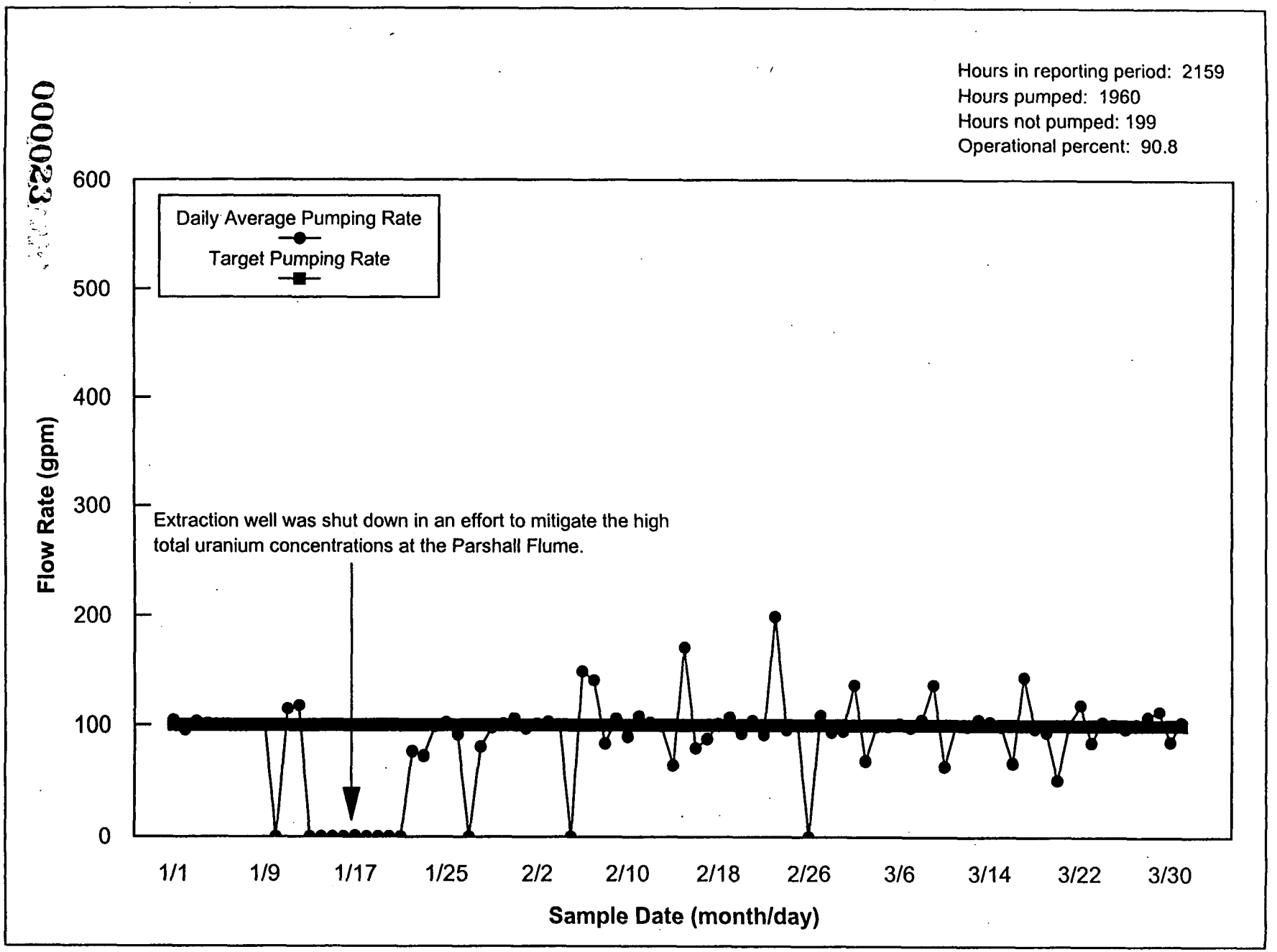


FIGURE 1-6. DAILY AVERAGE PUMPING RATES FOR SOUTH FIELD (PHASE 1) EXTRACTION WELL 31560, 1/99 - 3/99

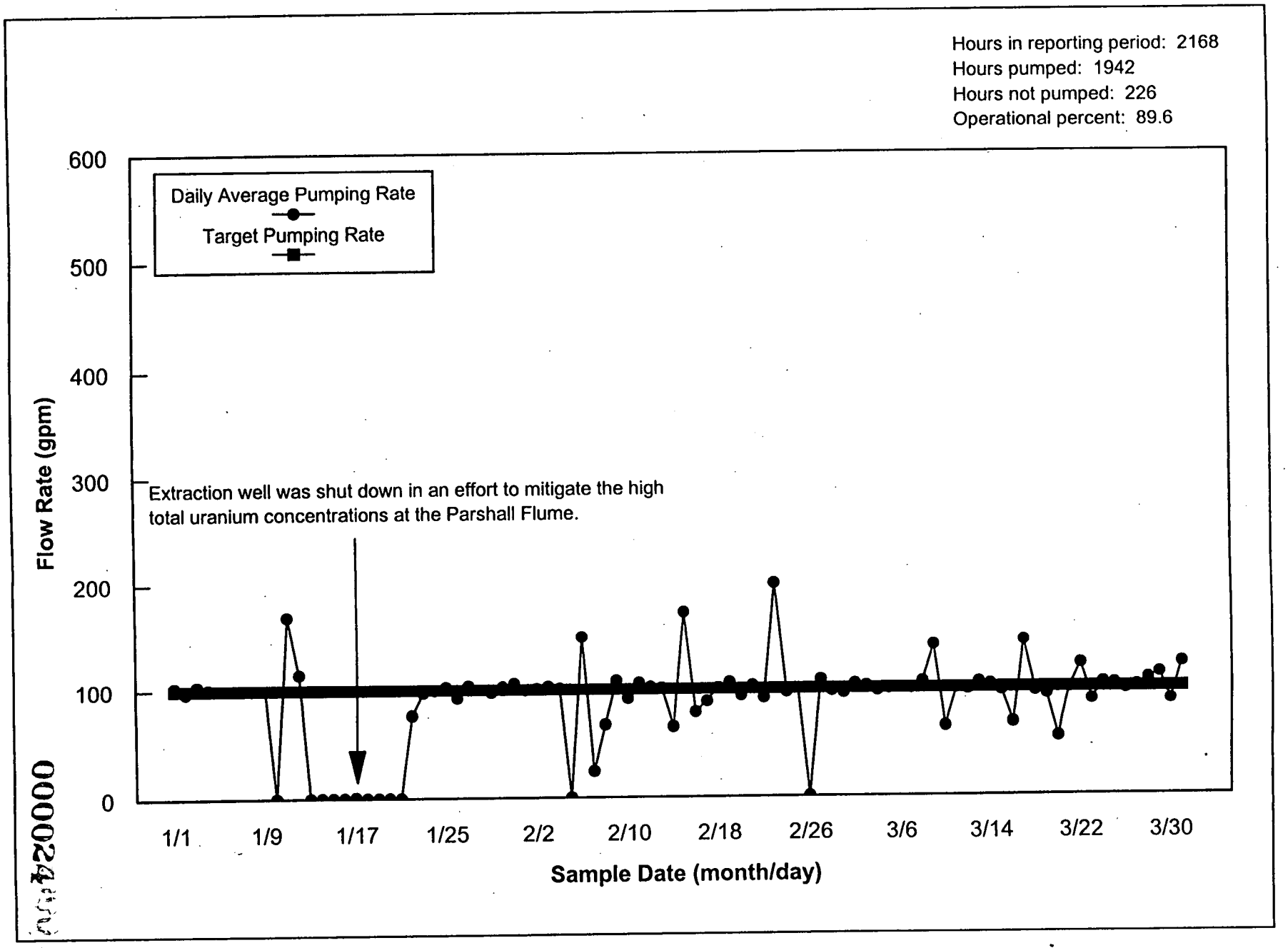


FIGURE 1-7. DAILY AVERAGE PUMPING RATES FOR SOUTH FIELD (PHASE 1) EXTRACTION WELL 31561, 1/99 - 3/99

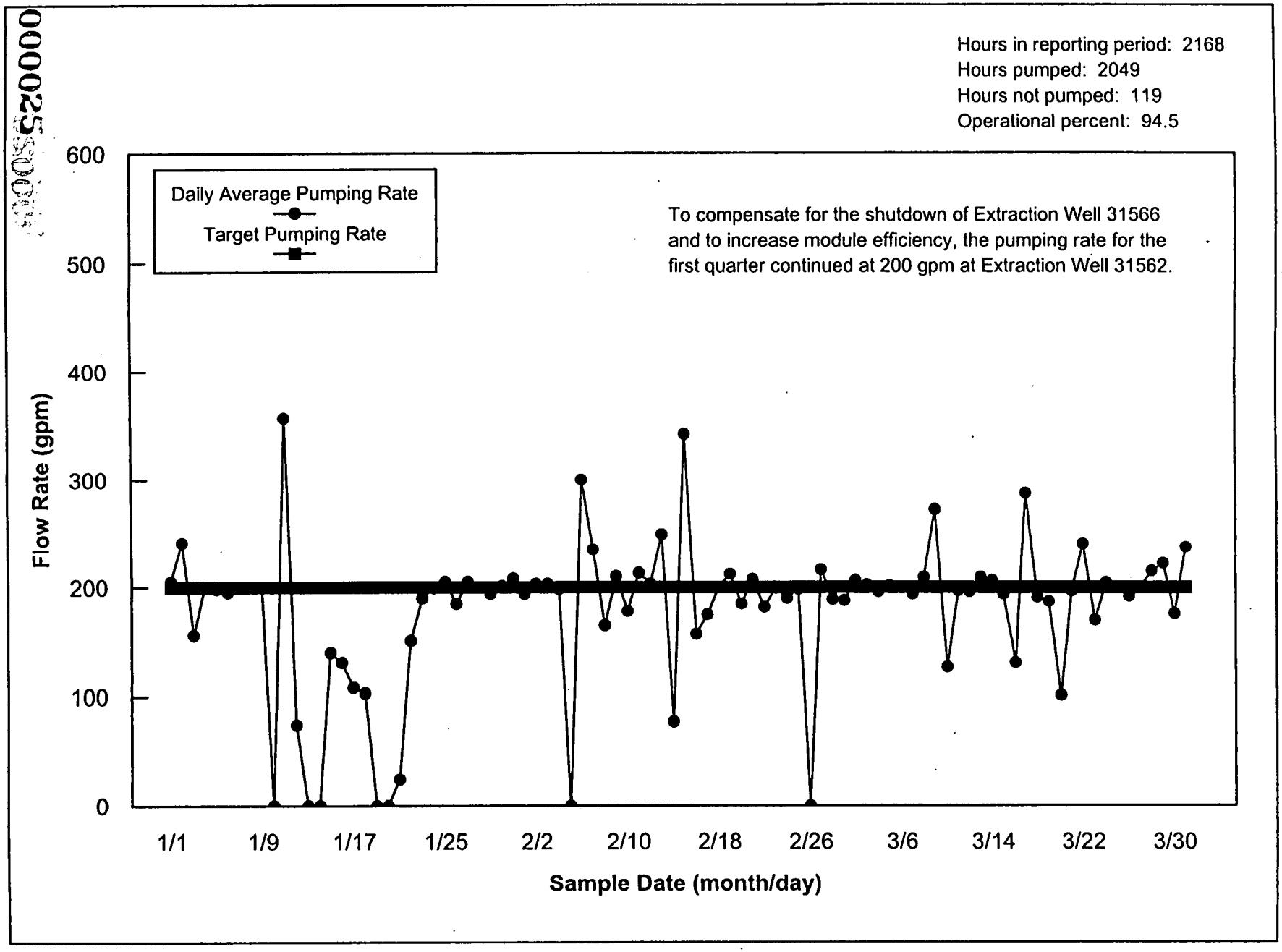


FIGURE 1-8. DAILY AVERAGE PUMPING RATES FOR SOUTH FIELD (PHASE 1) EXTRACTION WELL 31562, 1/99 - 3/99

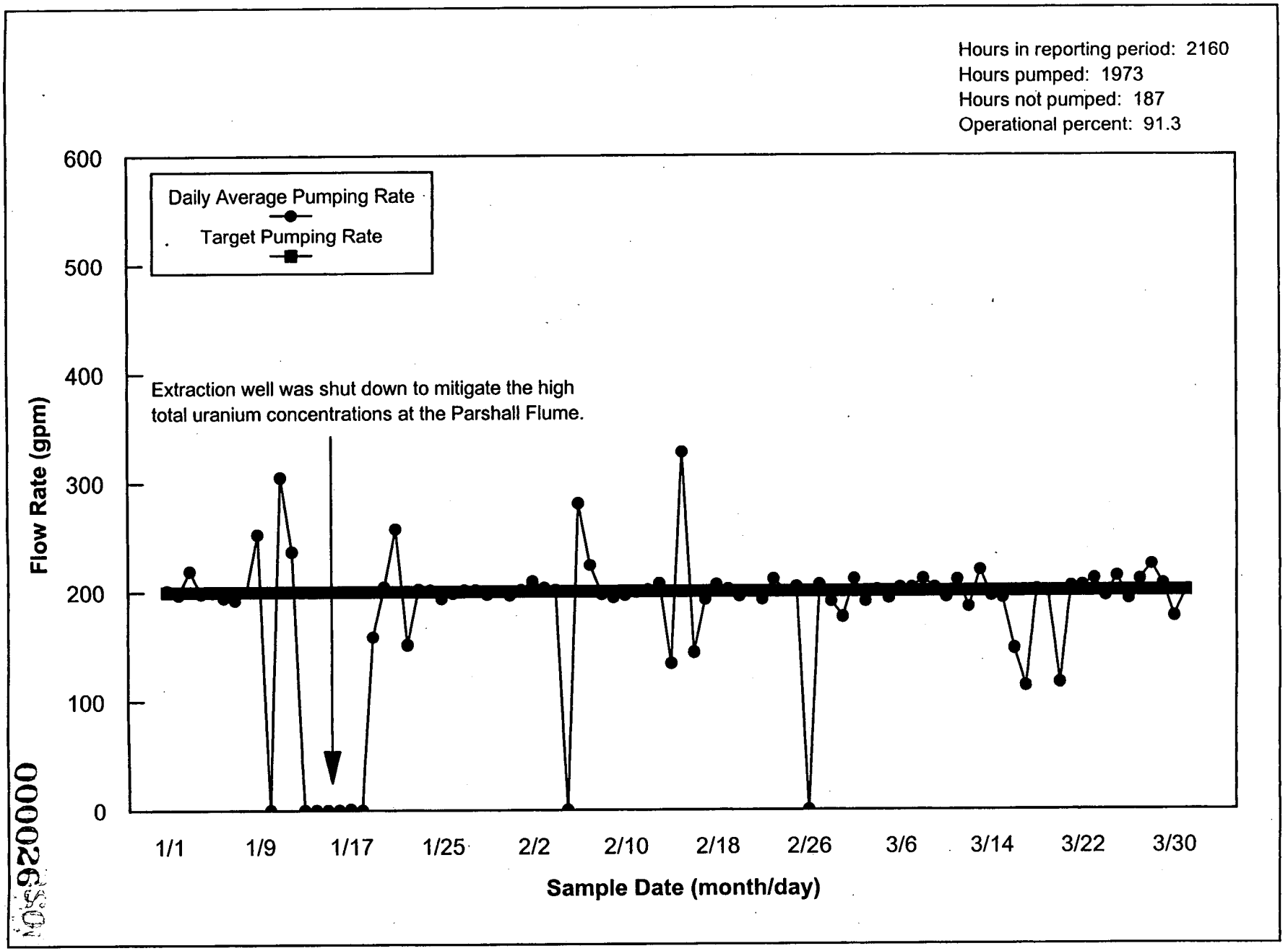


FIGURE 1-9. DAILY AVERAGE PUMPING RATES FOR SOUTH FIELD (PHASE 1) EXTRACTION WELL 31563, 1/99 - 3/99

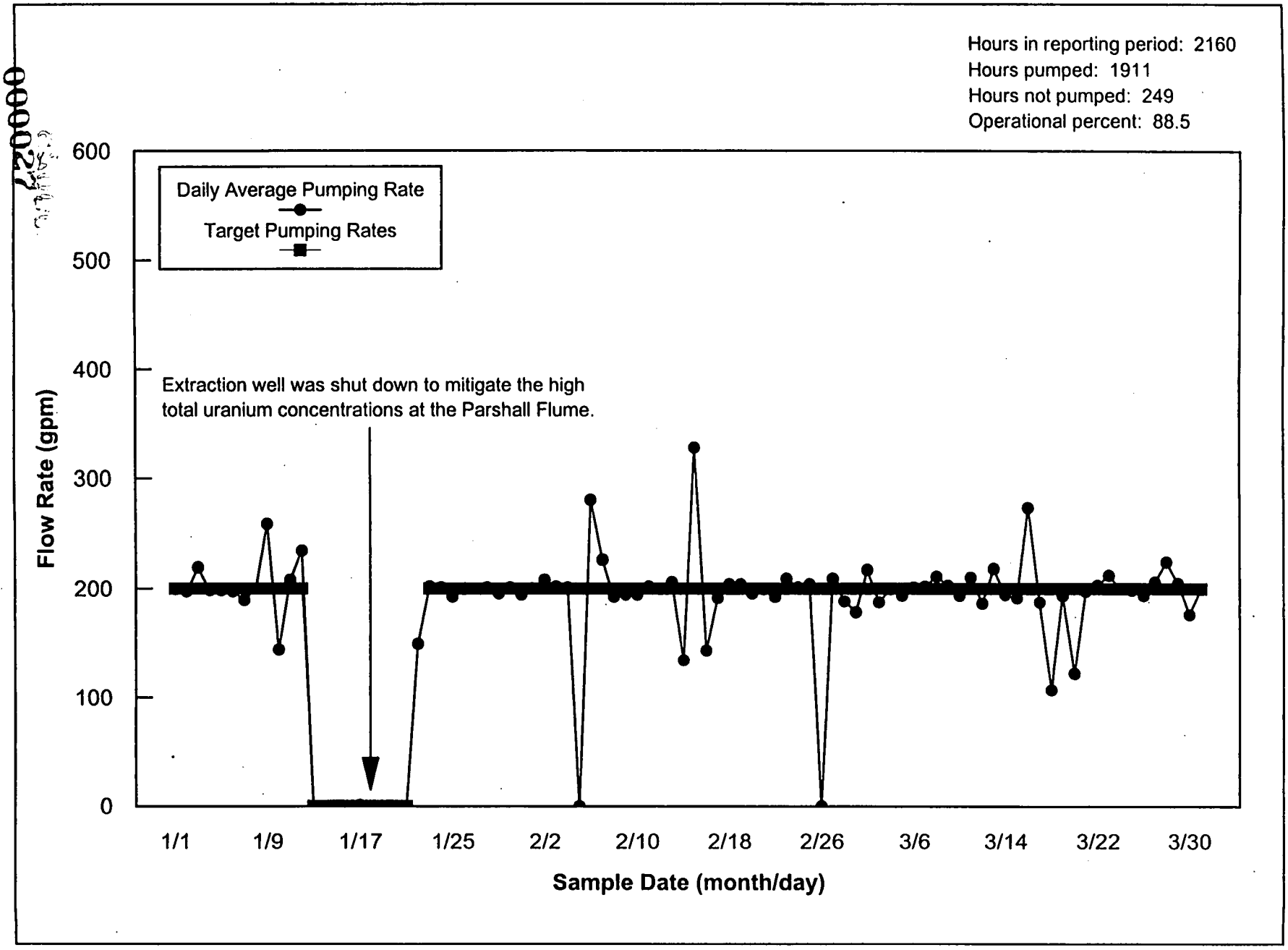


FIGURE 1-10. DAILY AVERAGE PUMPING RATES FOR SOUTH FIELD (PHASE 1) EXTRACTION WELL 31564, 1/99 - 3/99

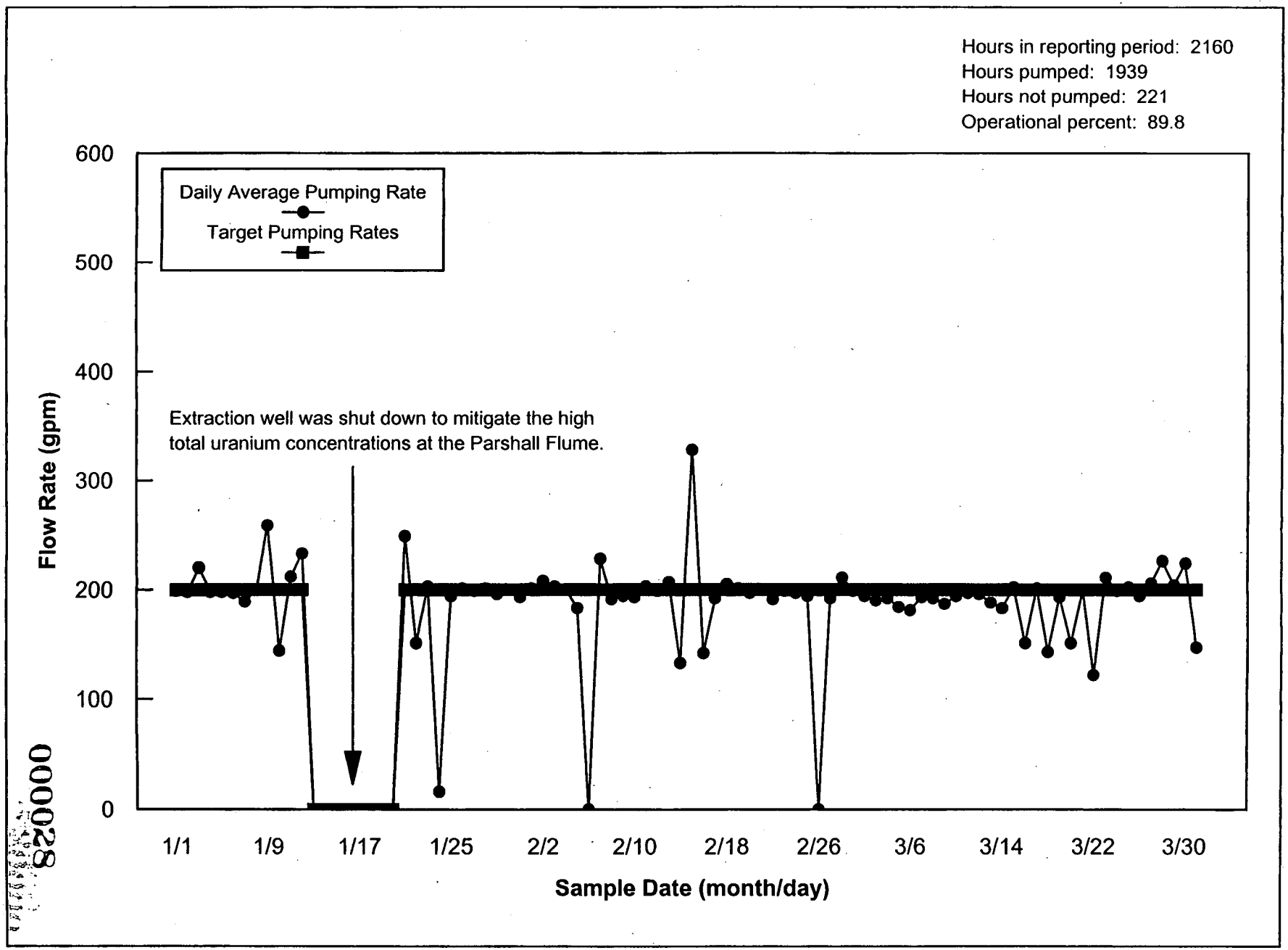


FIGURE 1-11. DAILY AVERAGE PUMPING RATES FOR SOUTH FIELD (PHASE 1) EXTRACTION WELL 31565, 1/99 - 3/99

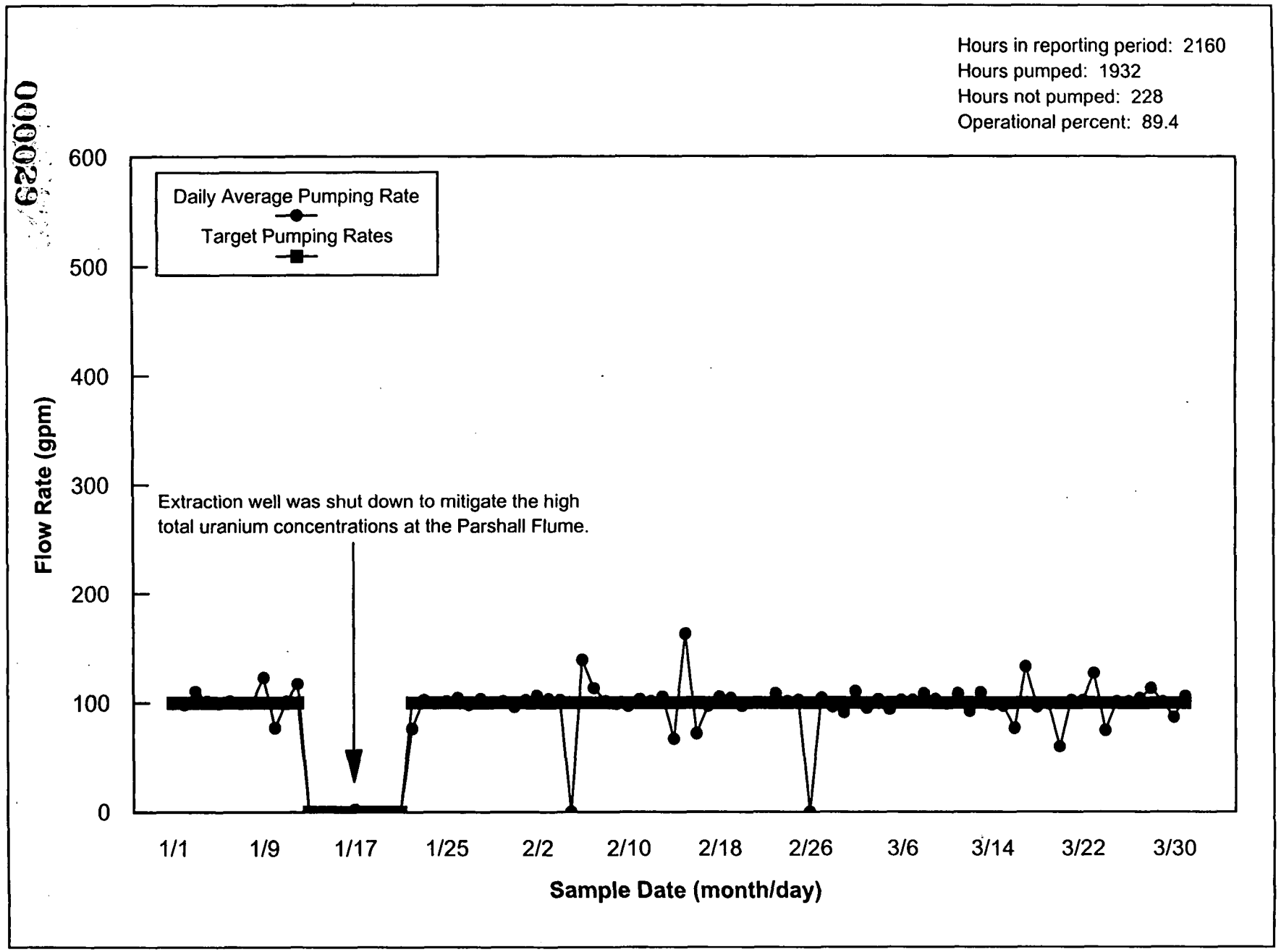


FIGURE 1-12. DAILY AVERAGE PUMPING RATES FOR SOUTH FIELD (PHASE 1) EXTRACTION WELL 31567, 1/99 - 3/99

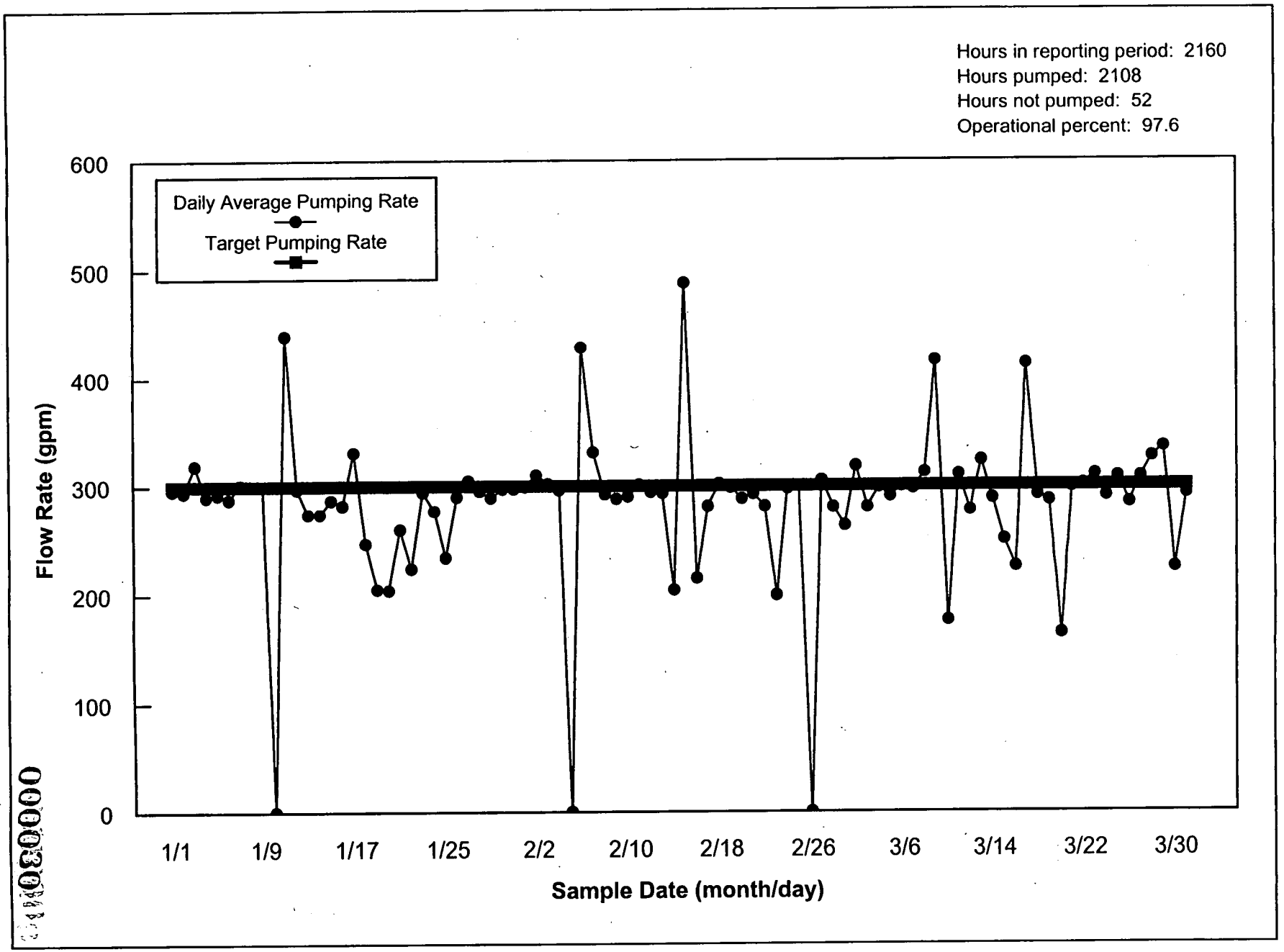


FIGURE 1-13. DAILY AVERAGE PUMPING RATES FOR SOUTH FIELD (PHASE 1) EXTRACTION WELL 32276, 1/99 - 3/99

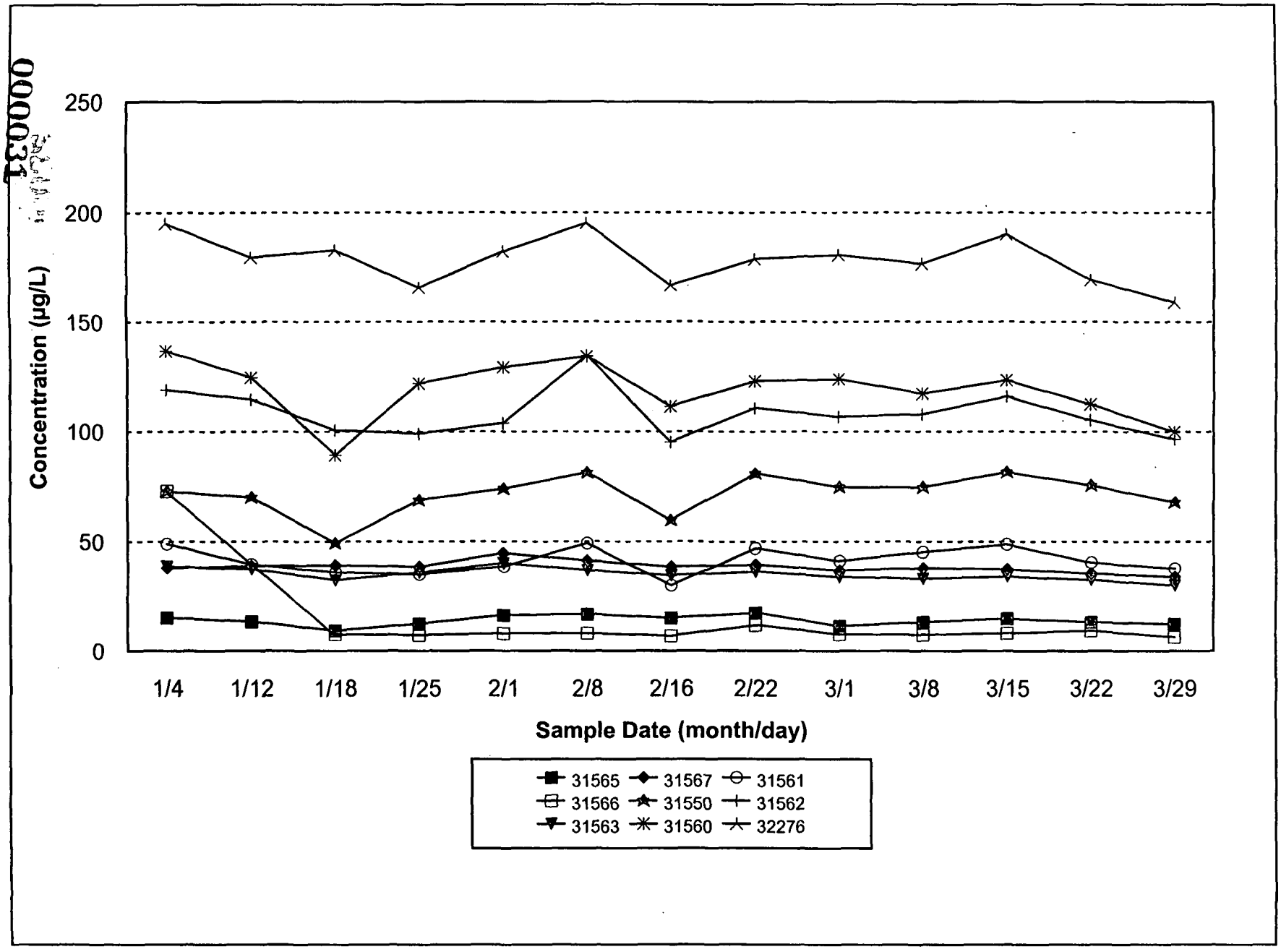


FIGURE 1-14. WEEKLY TOTAL URANIUM CONCENTRATIONS
FOR THE SOUTH FIELD (PHASE 1) EXTRACTION MODULE

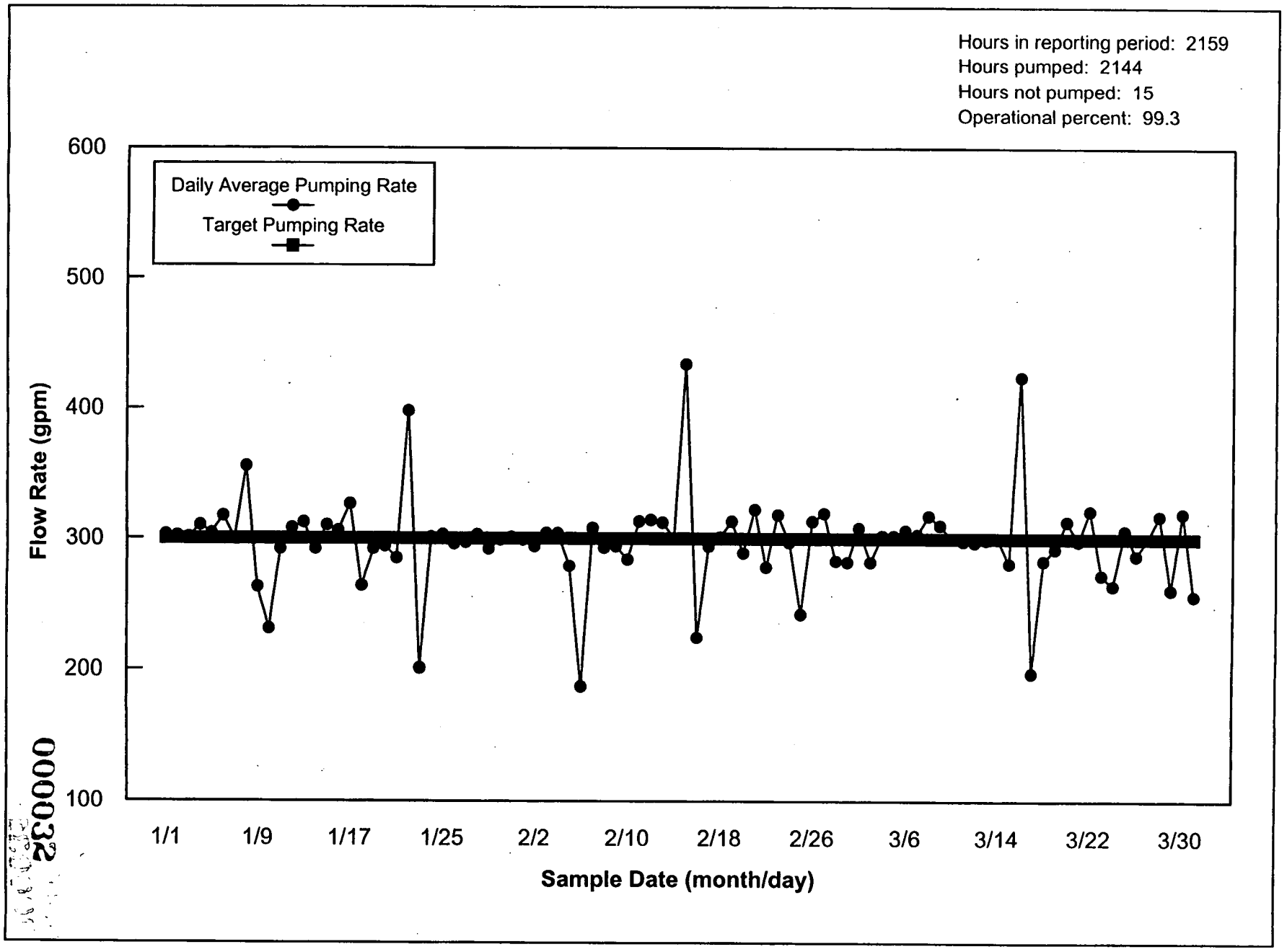


FIGURE 1-15. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME EXTRACTION WELL 3924, 1/99 - 3/99

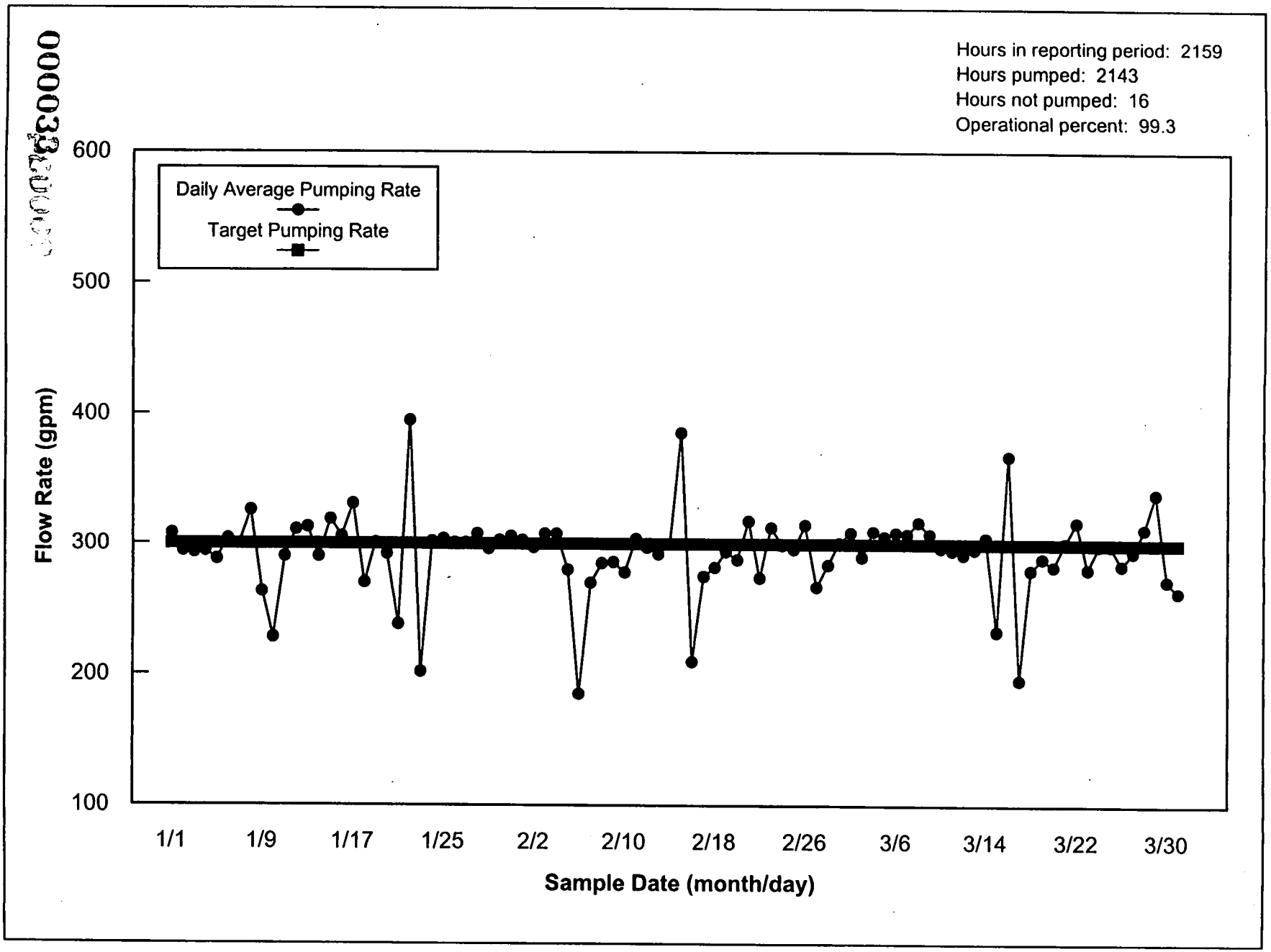


FIGURE 1-16. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME EXTRACTION WELL 3925, 1/99 - 3/99

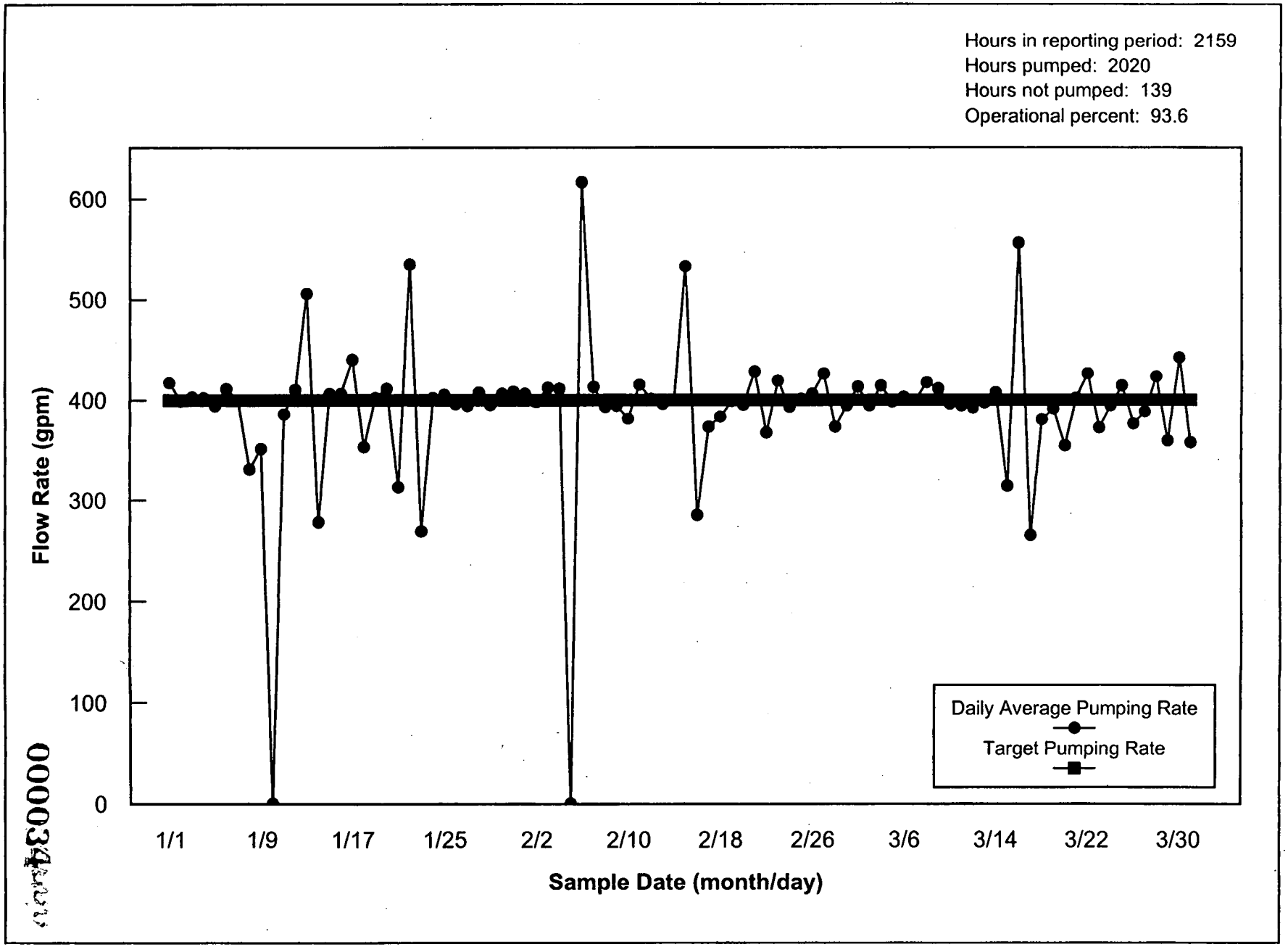


FIGURE 1-17. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME EXTRACTION WELL 3926, 1/99 - 3/99

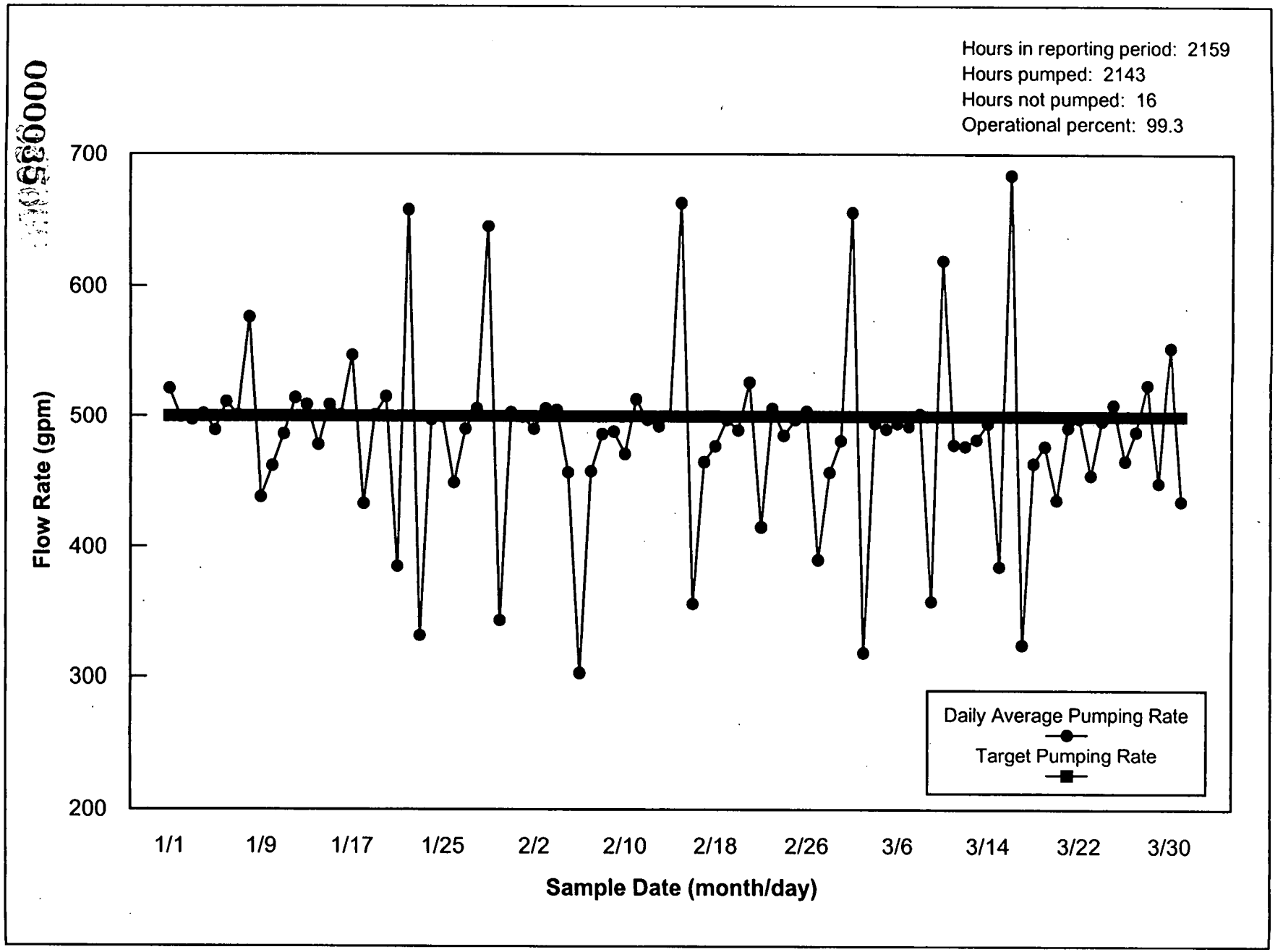


FIGURE 1-18. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME EXTRACTION WELL 3927, 1/99 - 3/99

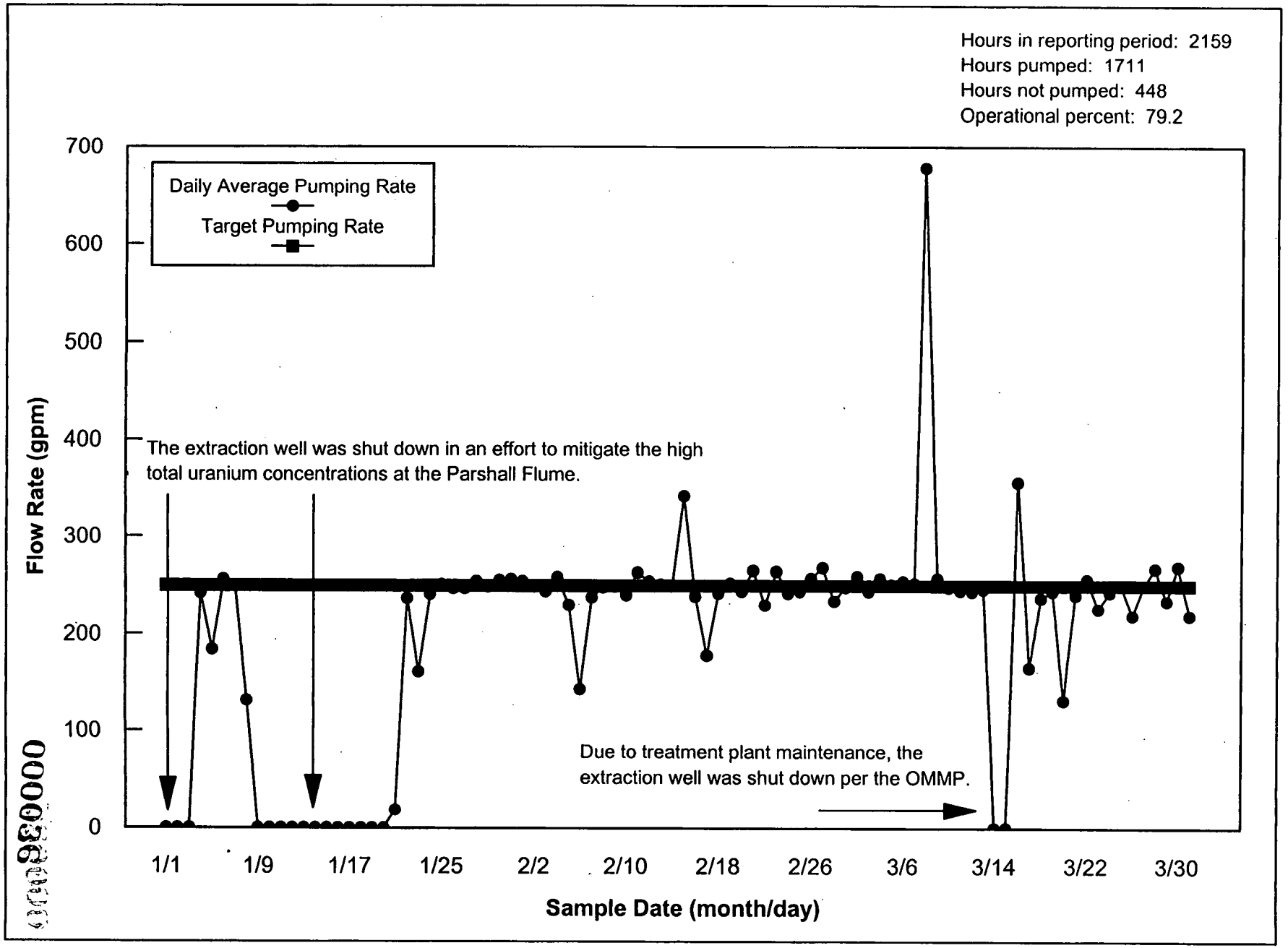


FIGURE 1-19. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME EXTRACTION WELL 32308, 1/99 - 3/99

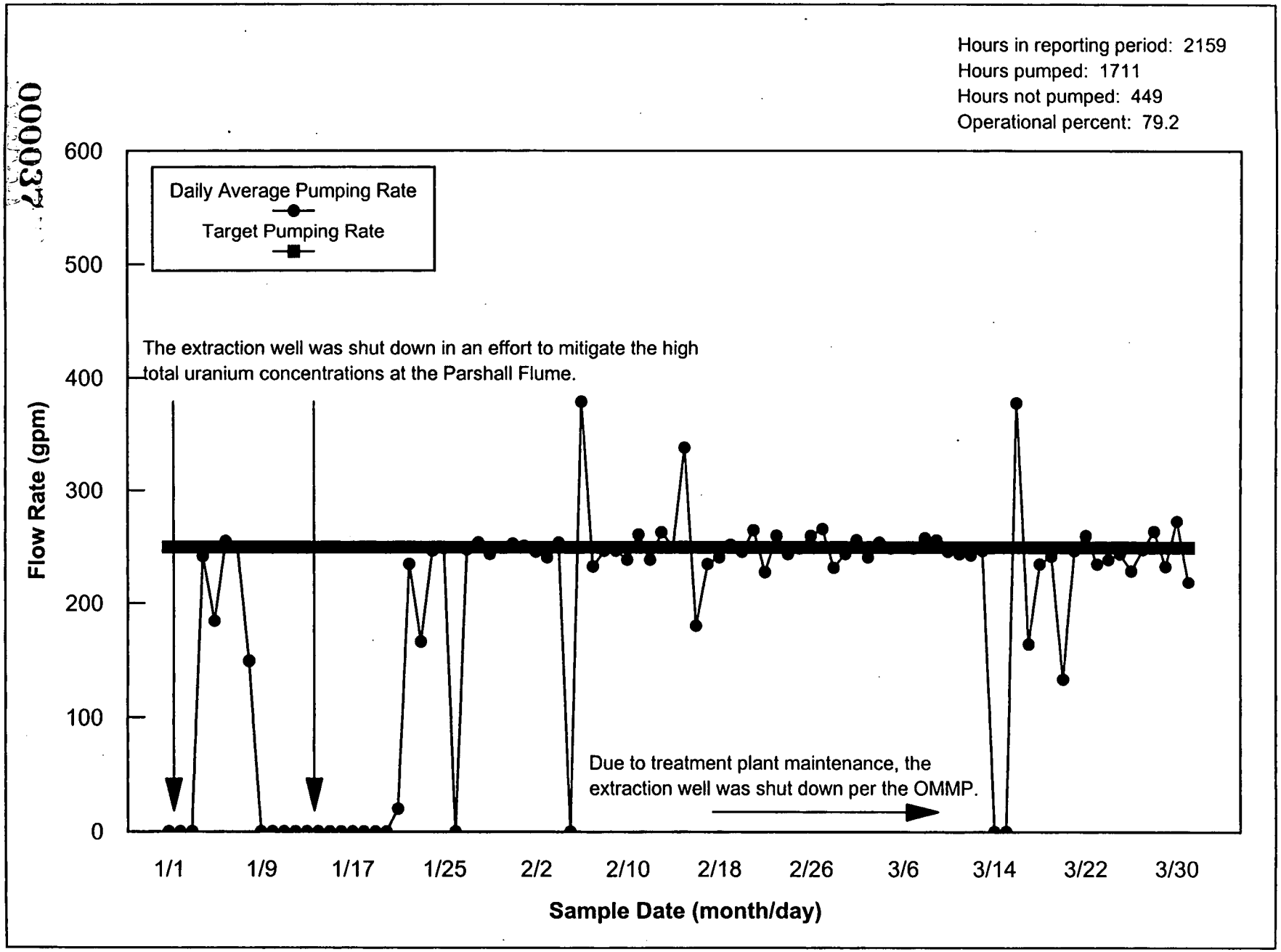


FIGURE 1-20. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME EXTRACTION WELL 32309, 1/99 - 3/99

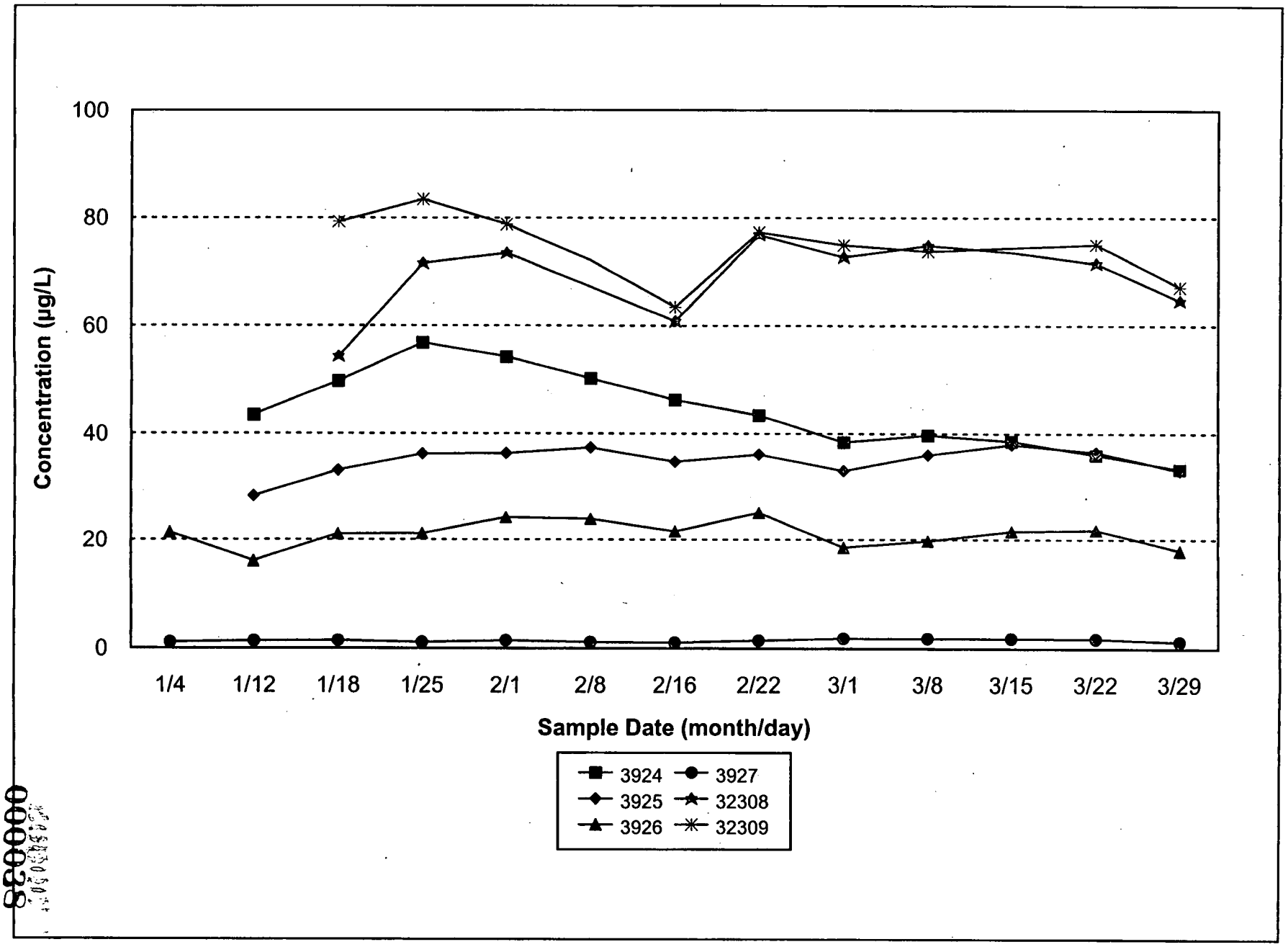


FIGURE 1-21. WEEKLY TOTAL URANIUM CONCENTRATIONS FOR THE SOUTH PLUME MODULE

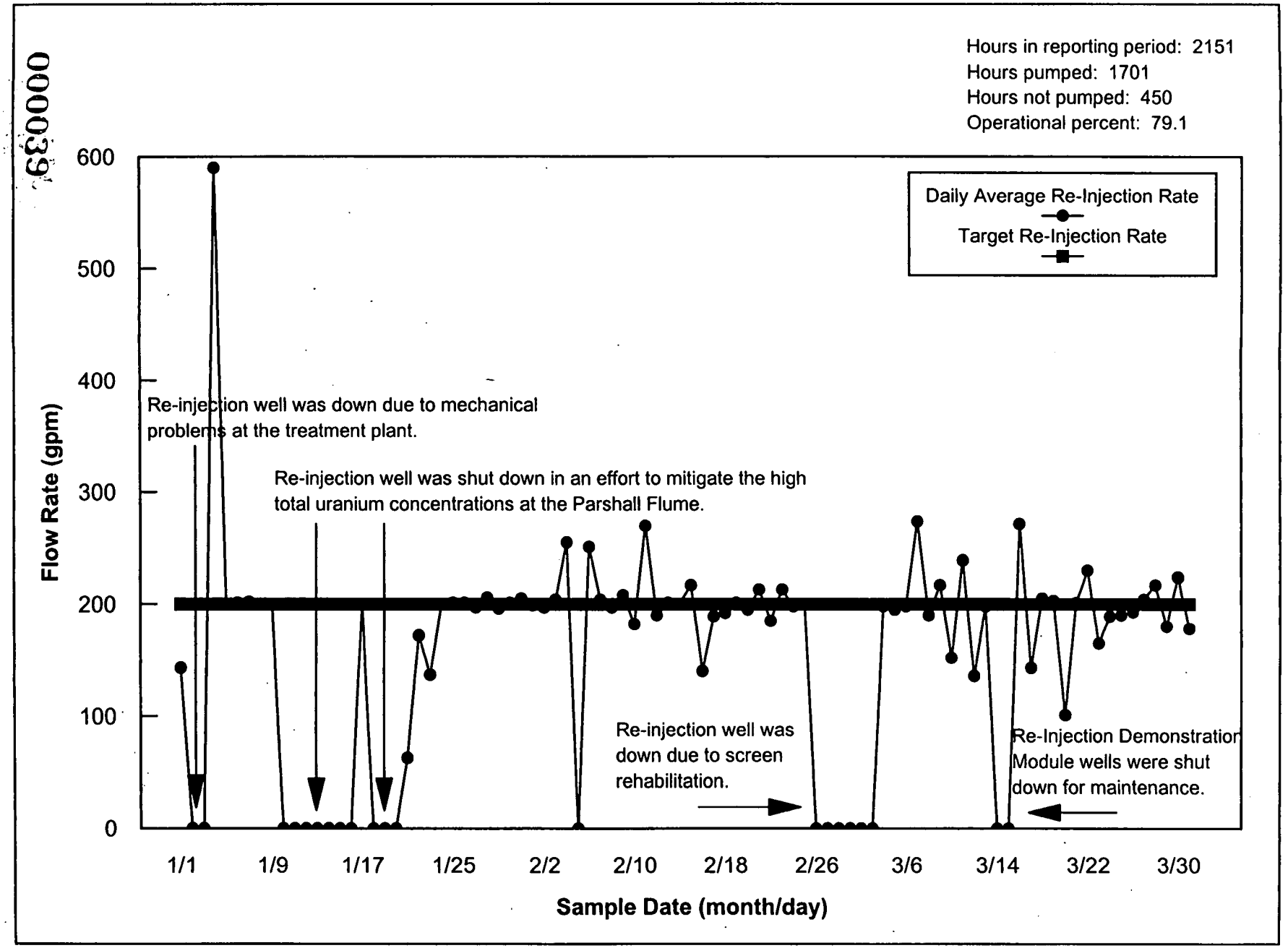


FIGURE 1-22. DAILY AVERAGE RE-INJECTION RATES FOR RE-INJECTION WELL 22107, 1/99 - 3/99

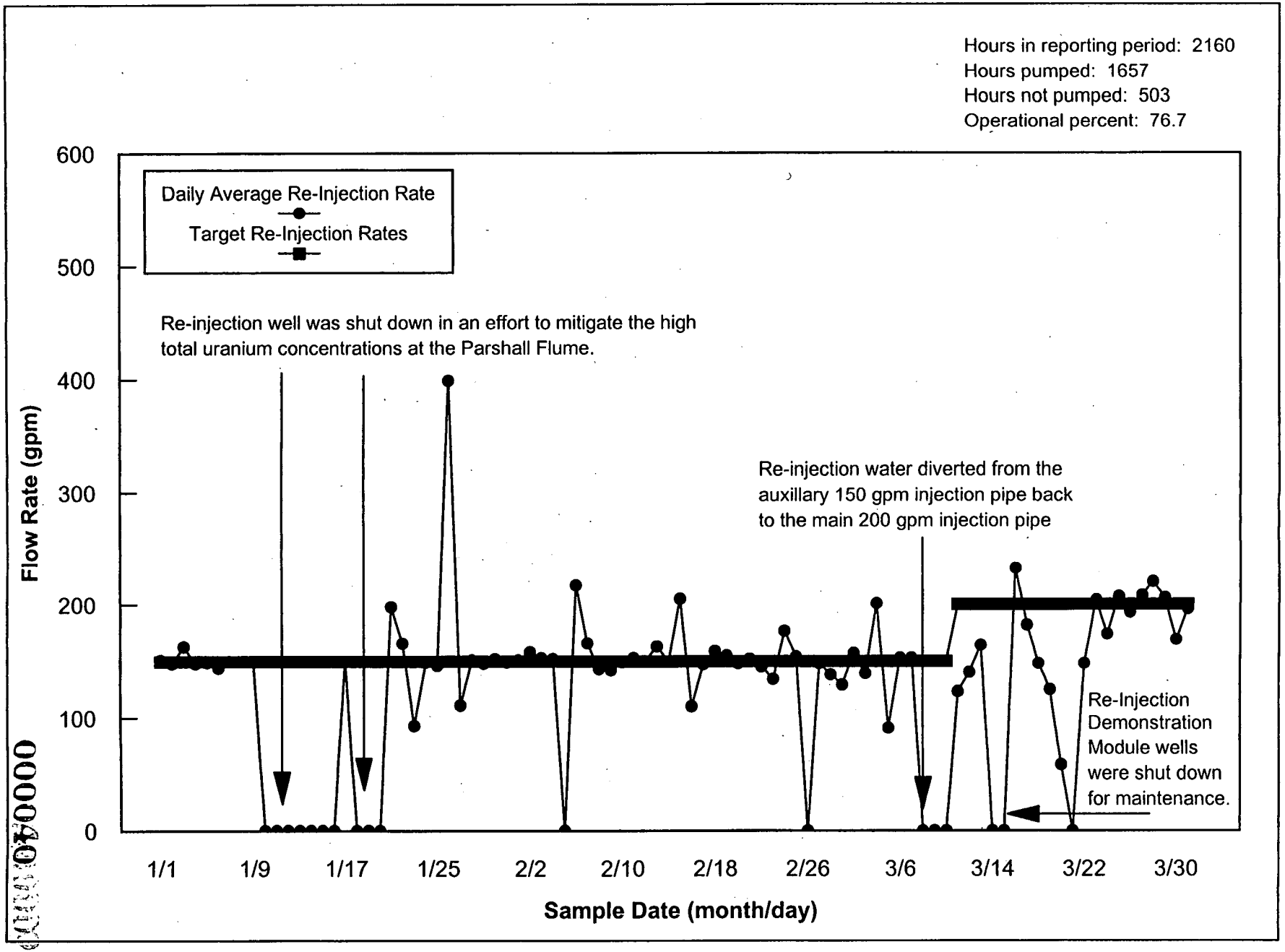


FIGURE 1-23. DAILY AVERAGE RE-INJECTION RATES FOR RE-INJECTION WELL 22108, 1/99 - 3/99

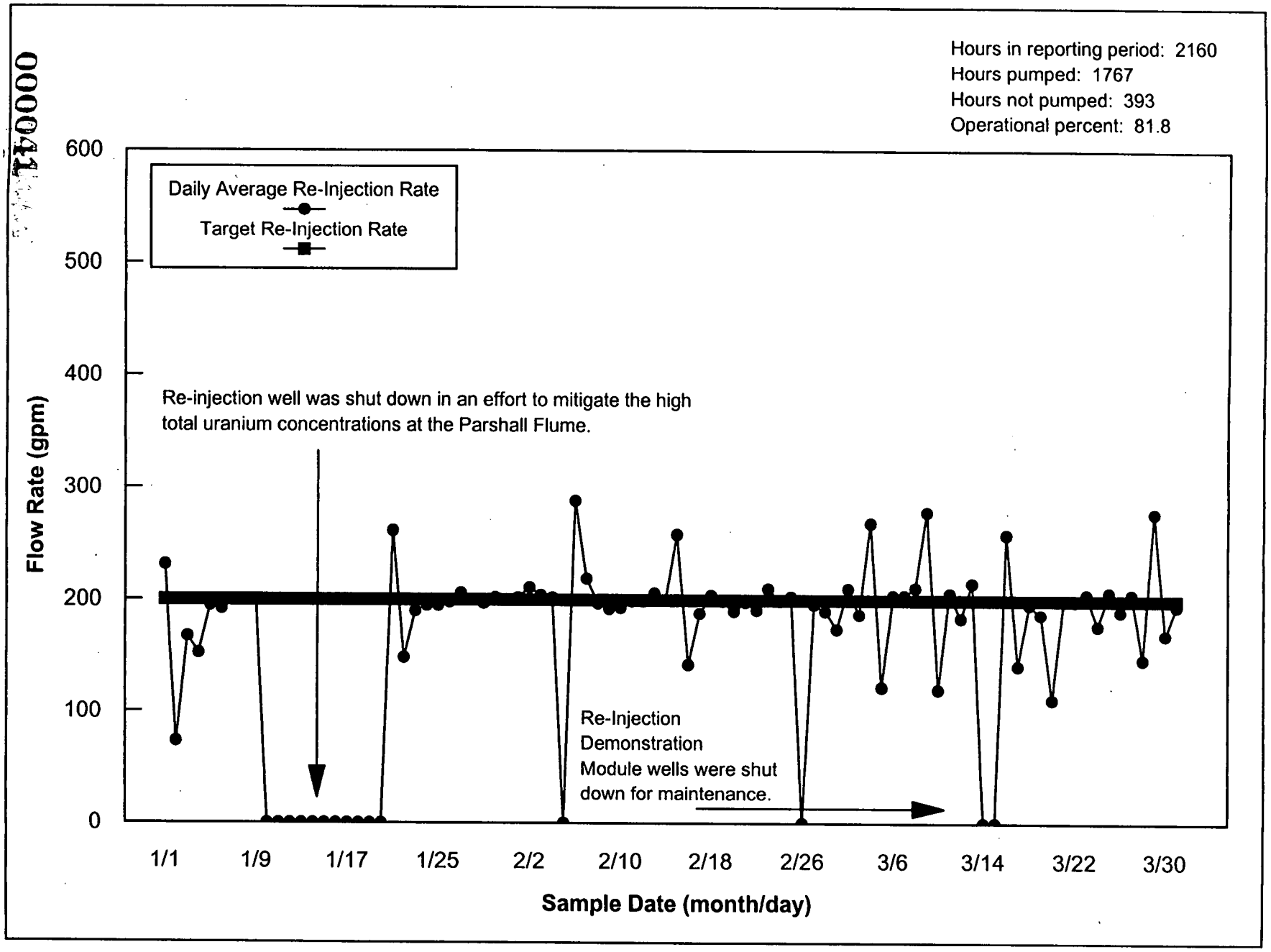


FIGURE 1-24. DAILY AVERAGE RE-INJECTION RATES FOR RE-INJECTION WELL 22109, 1/99 - 3/99

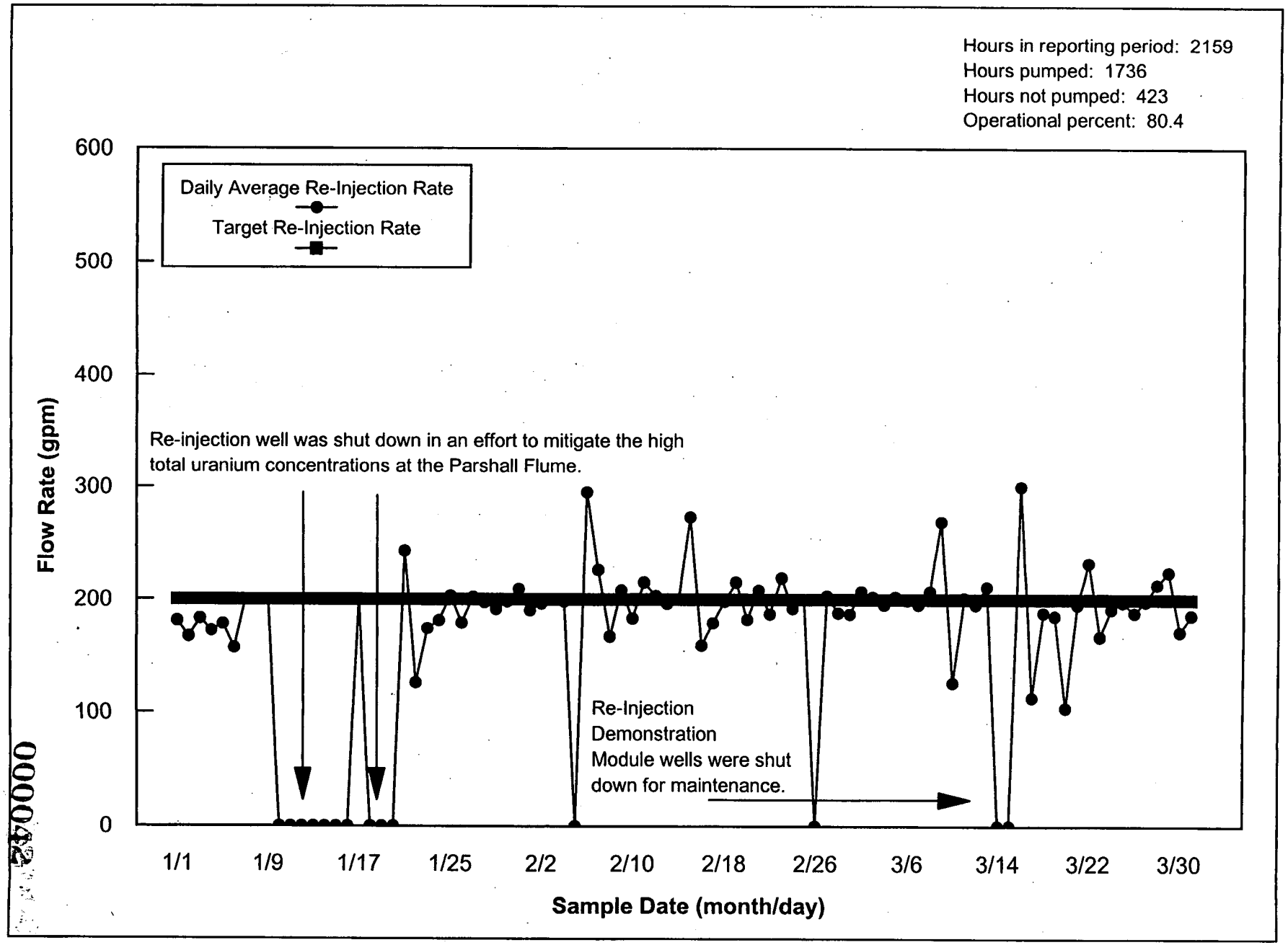


FIGURE 1-25. DAILY AVERAGE RE-INJECTION RATES FOR RE-INJECTION WELL 22111, 1/99 - 3/99

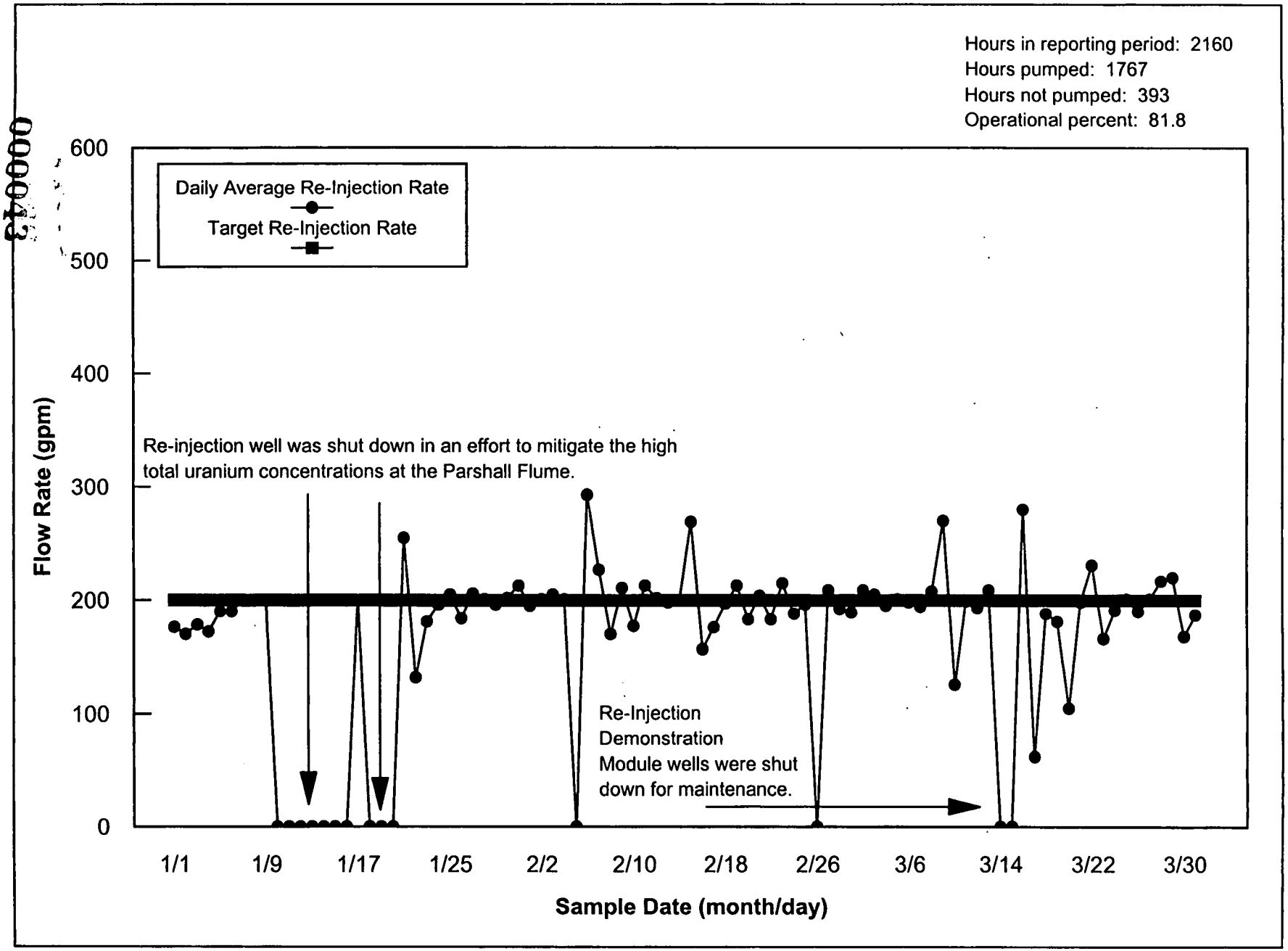


FIGURE 1-26. DAILY AVERAGE RE-INJECTION RATES FOR RE-INJECTION WELL 22240, 1/99 - 3/99

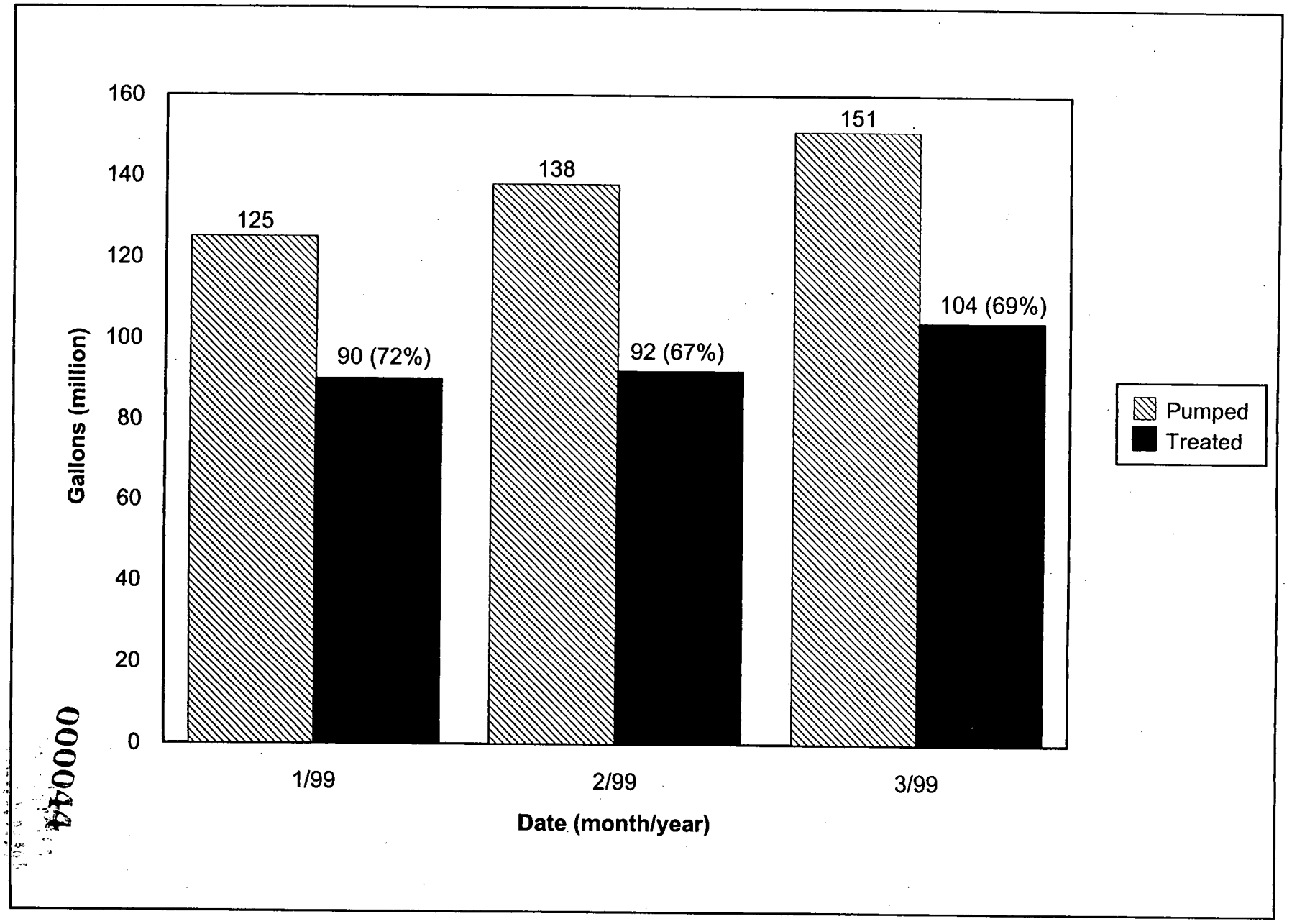


FIGURE 1-27. TOTAL GROUNDWATER PUMPED VS. GROUNDWATER TREATED FOR FIRST QUARTER 1999

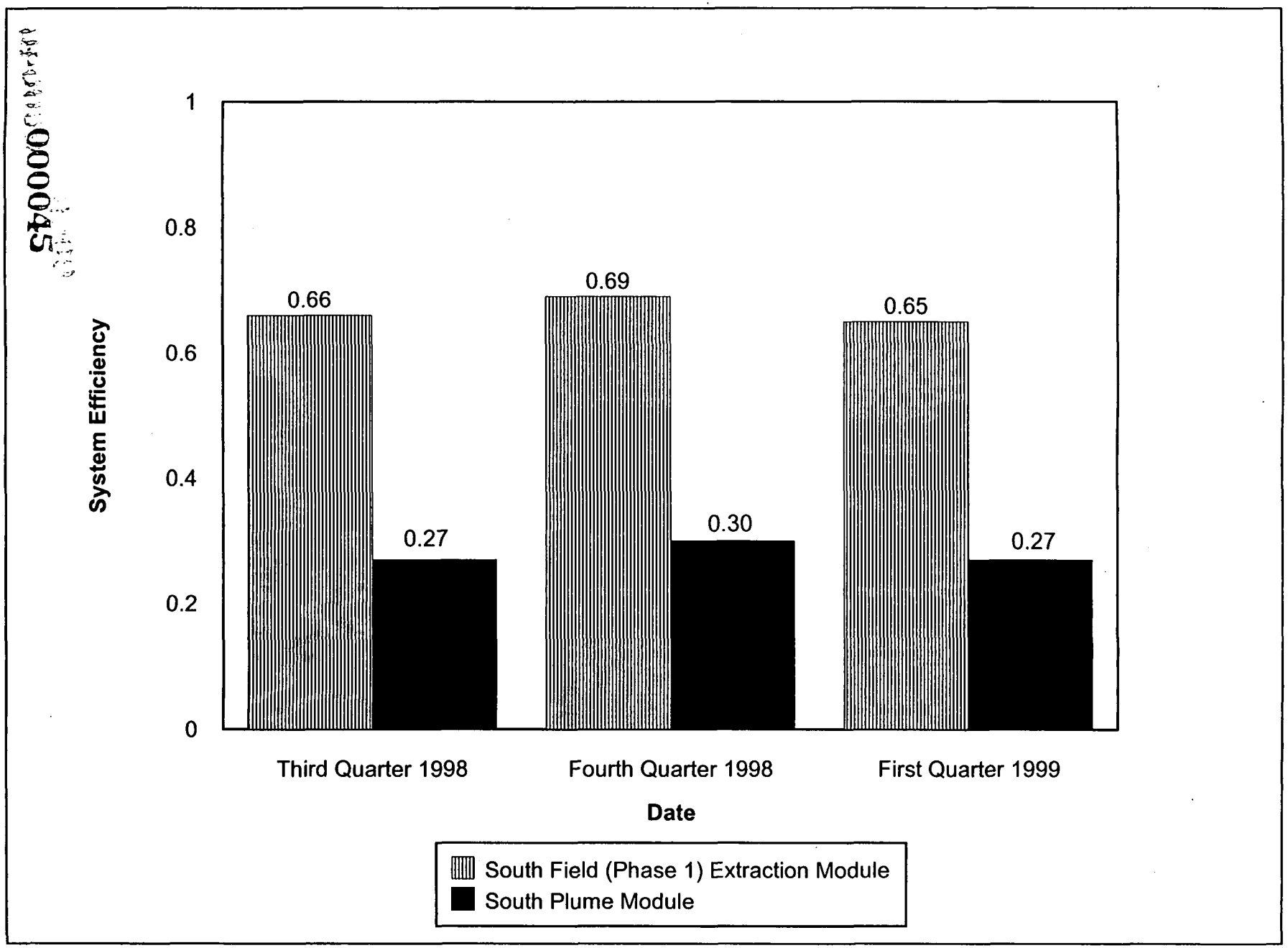
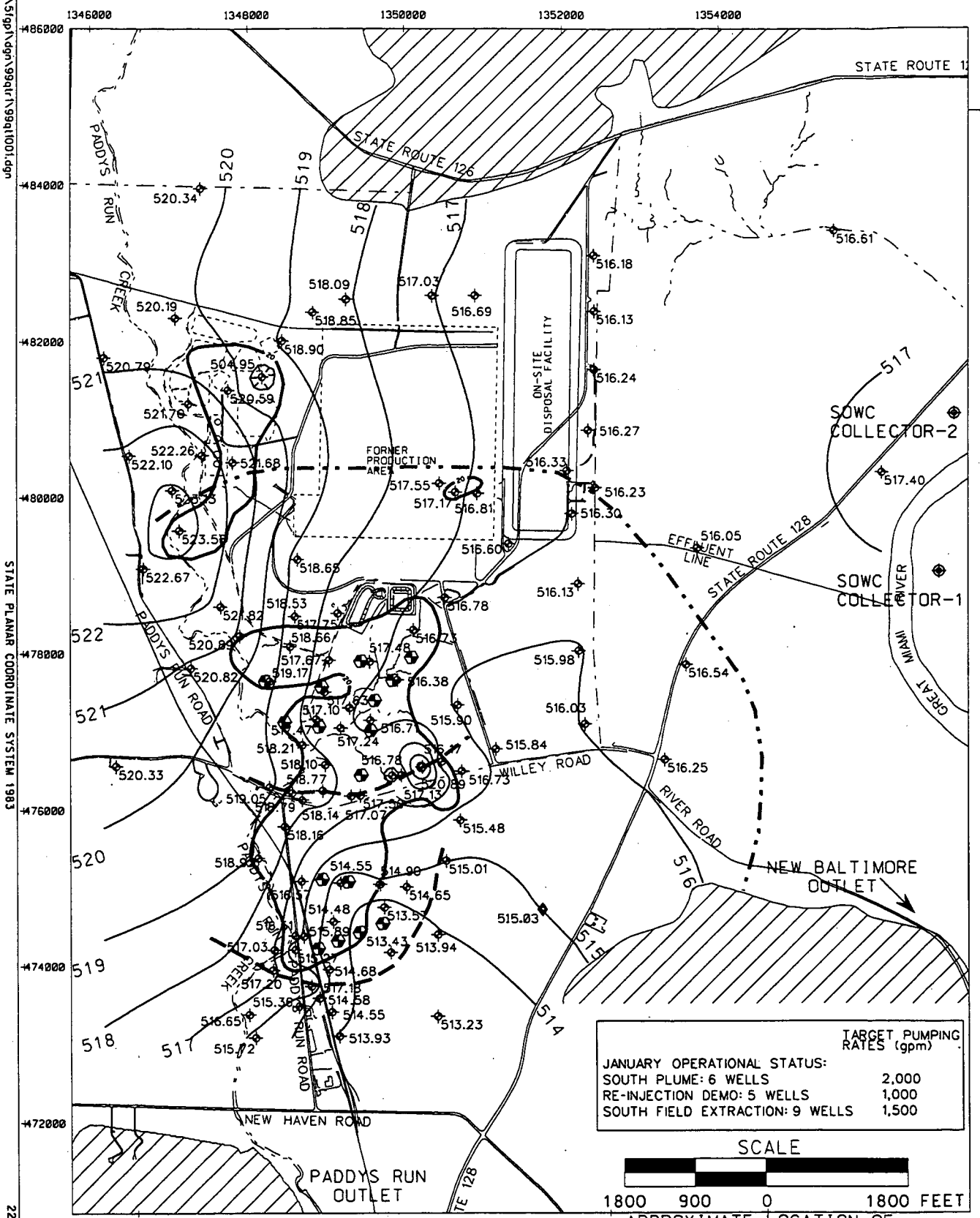


FIGURE 1-28. SOUTH FIELD (PHASE 1) EXTRACTION AND SOUTH PLUME MODULES' EFFICIENCIES (LBS OF URANIUM REMOVED/MILLION GALLONS PUMPED)



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STATE PLANAR COORDINATE SYSTEM 1983

22-JUN-1999

FIGURE 1-29. ROUTINE GROUNDWATER ELEVATIONS FOR TYPE 2 WELLS, JANUARY 1999

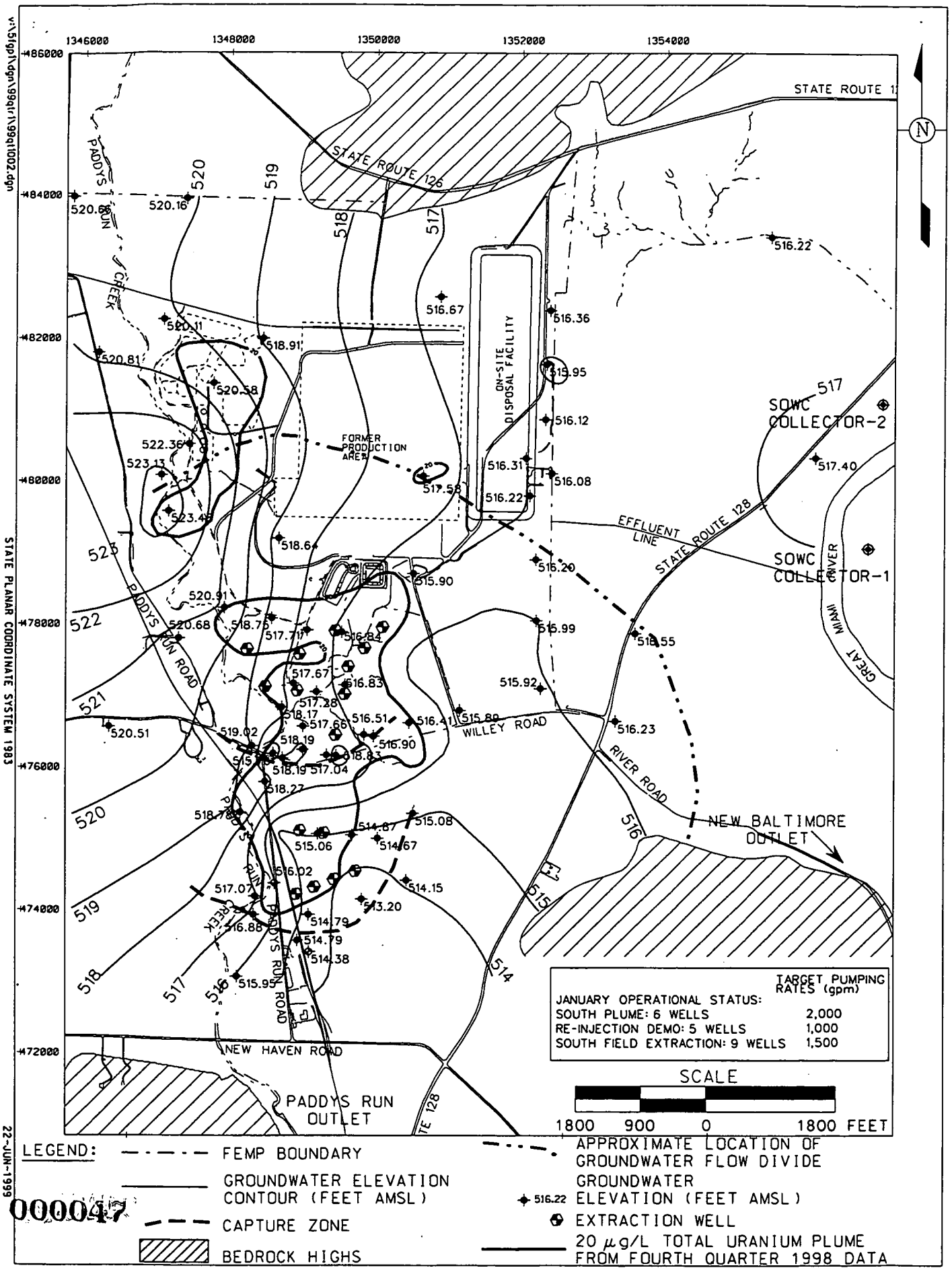

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FIGURE 1-30. ROUTINE GROUNDWATER ELEVATIONS FOR TYPE 3 WELLS, JANUARY 1999

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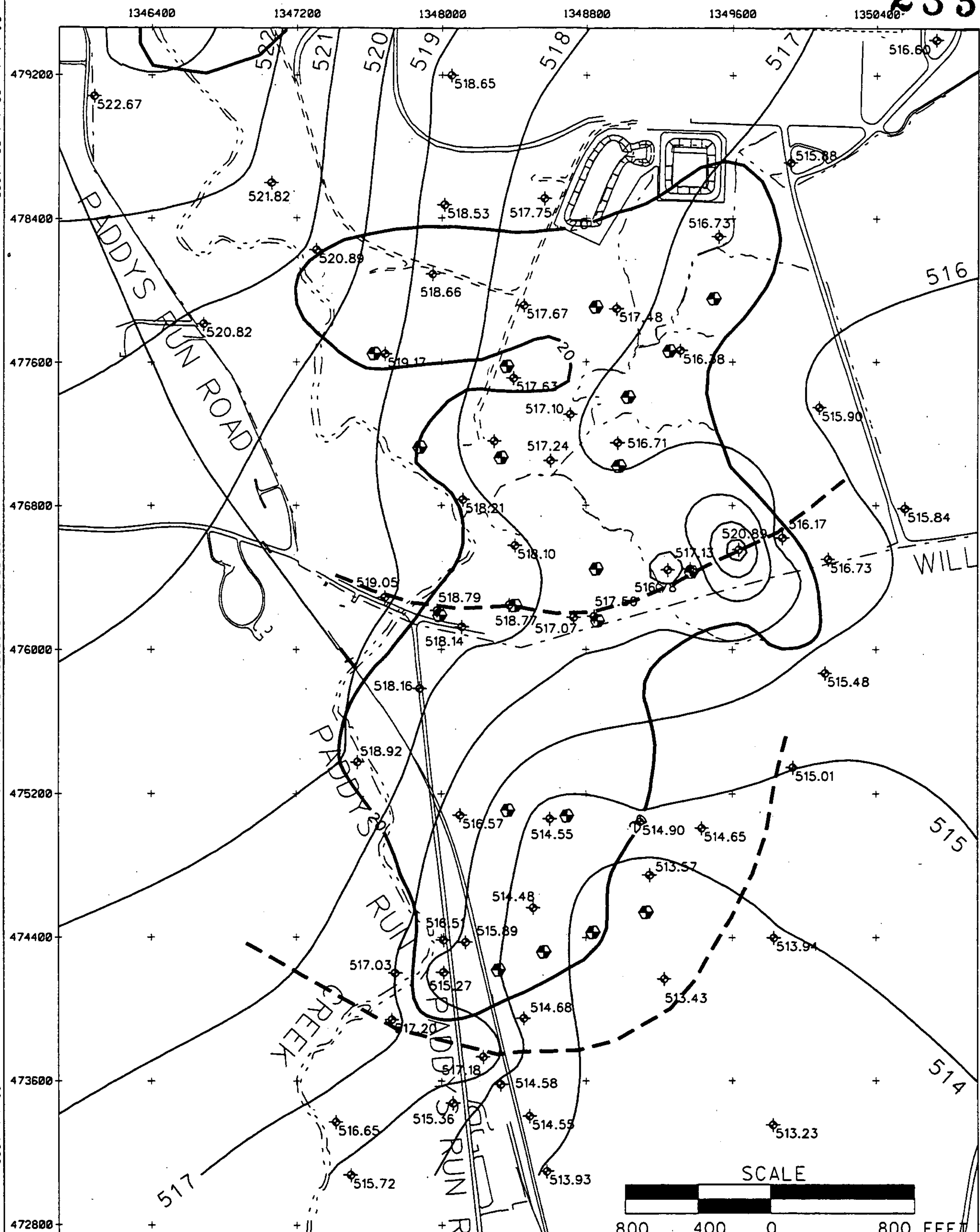
v:\5fgpl\dgn\99qtr1\99qt1003.dgn



STATE PLANAR COORDINATE SYSTEM 1983

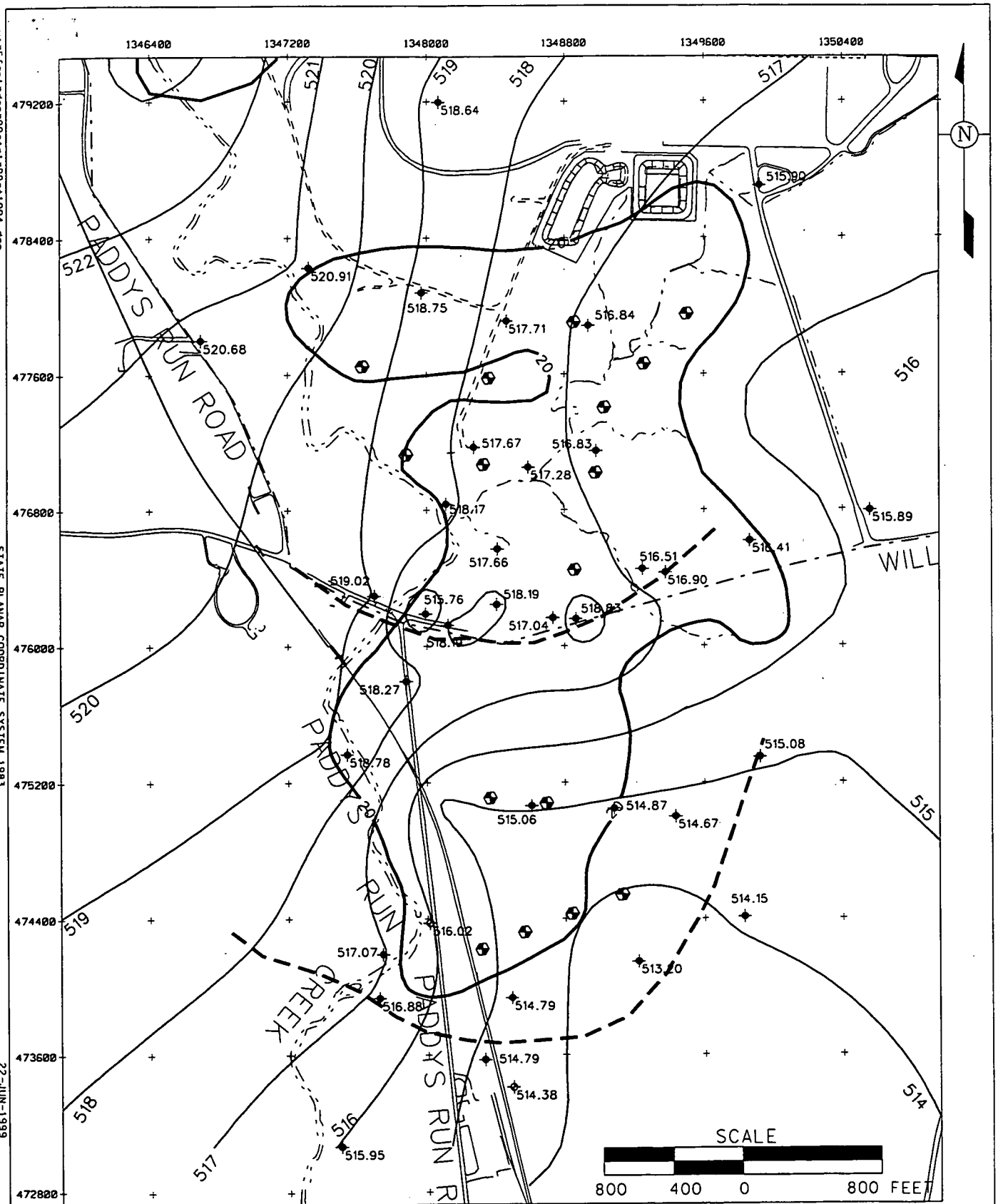
22-JUN-1999

LEGEND:

- FEMP BOUNDARY
- GROUNDWATER ELEVATION CONTOUR (FEET AMSL)
- CAPTURE ZONE
- 517.76 GROUNDWATER ELEVATION (FEET AMSL)
- EXTRACTION WELL
- 20 $\mu g/L$ TOTAL URANIUM PLUME FROM FOURTH QUARTER 1998 DATA

000048

FIGURE 1-31. DETAILED GROUNDWATER ELEVATIONS FOR TYPE 2 MONITORING WELLS, JANUARY 1999



LEGEND:

- FEMP BOUNDARY
- GROUNDWATER ELEVATION CONTOUR (FEET AMSL)
- CAPTURE ZONE
- 517.76 GROUNDWATER ELEVATION (FEET AMSL)
- EXTRACTION WELL
- 20 μg/L TOTAL URANIUM PLUME FROM FOURTH QUARTER 1998 DATA

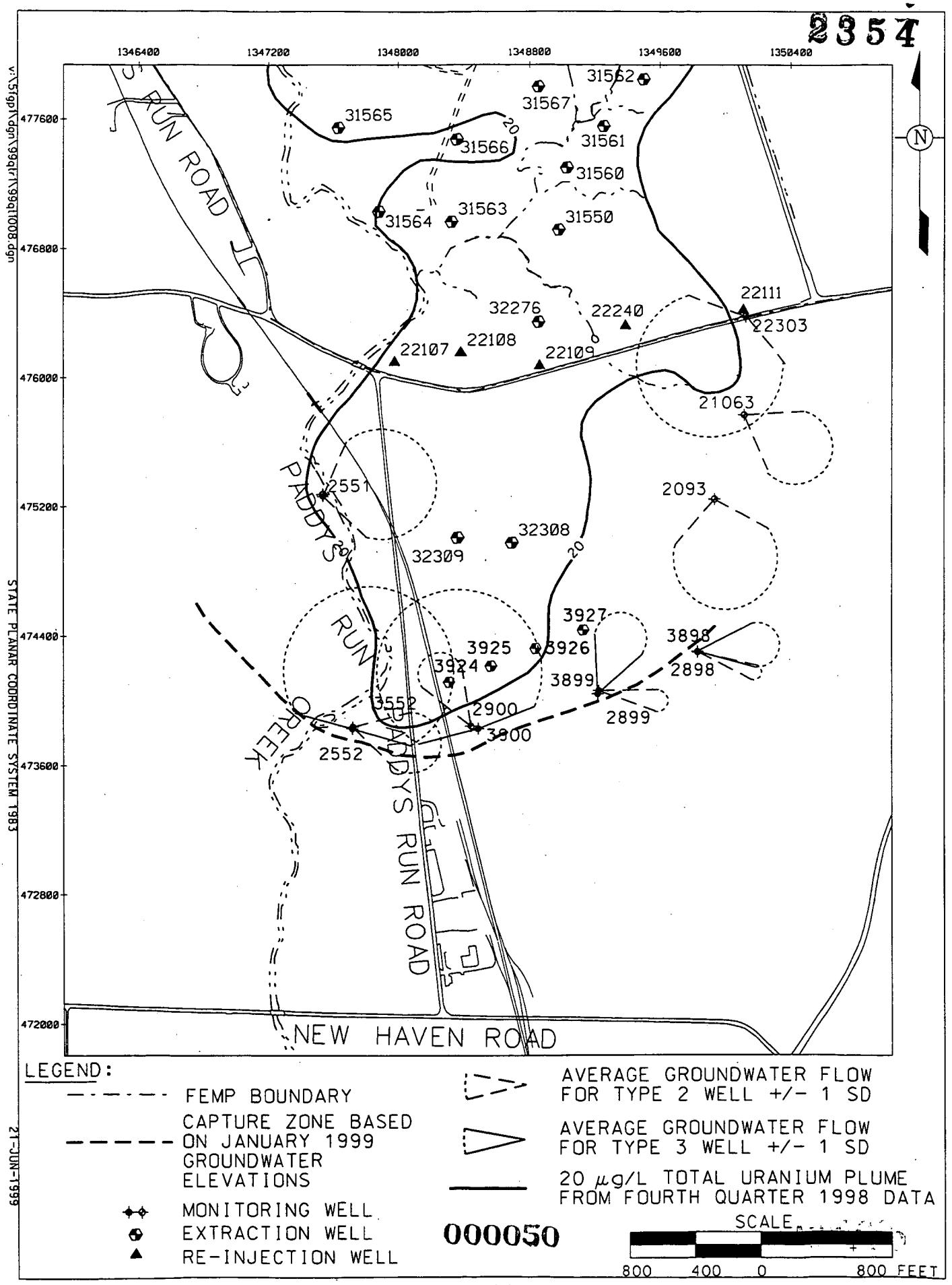
v:\5fop1\dgn\99q1r1\99q1004.dgn

STATE PLANAR COORDINATE SYSTEM 1983

22-JUN-1999

000049

FIGURE 1-32. DETAILED GROUNDWATER ELEVATIONS FOR TYPE 3 WELLS, JANUARY 1999



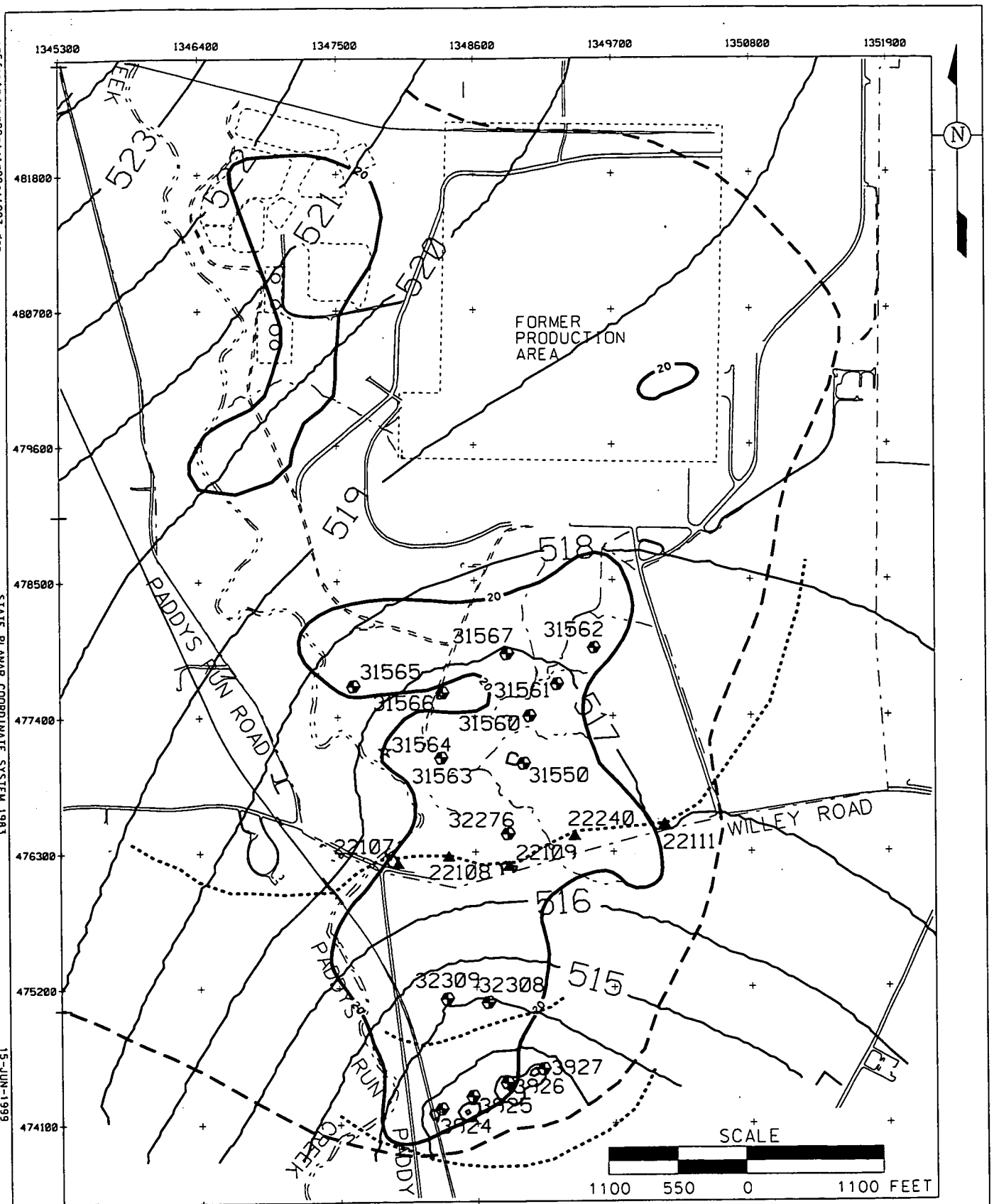
LEGEND:

- FEMP BOUNDARY
- CAPTURE ZONE BASED ON JANUARY 1999 GROUNDWATER ELEVATIONS
- MONITORING WELL
- EXTRACTION WELL
- RE-INJECTION WELL
- AVERAGE GROUNDWATER FLOW FOR TYPE 2 WELL +/- 1 SD
- AVERAGE GROUNDWATER FLOW FOR TYPE 3 WELL +/- 1 SD
- 20 µg/L TOTAL URANIUM PLUME FROM FOURTH QUARTER 1998 DATA

000050

SCALE
800 400 0 800 FEET

FIGURE 1-33. COLLOIDAL BORESCOPE FLOW VECTORS AT SOUTHERN EXTENT OF CAPTURE ZONE, FIRST QUARTER 1999



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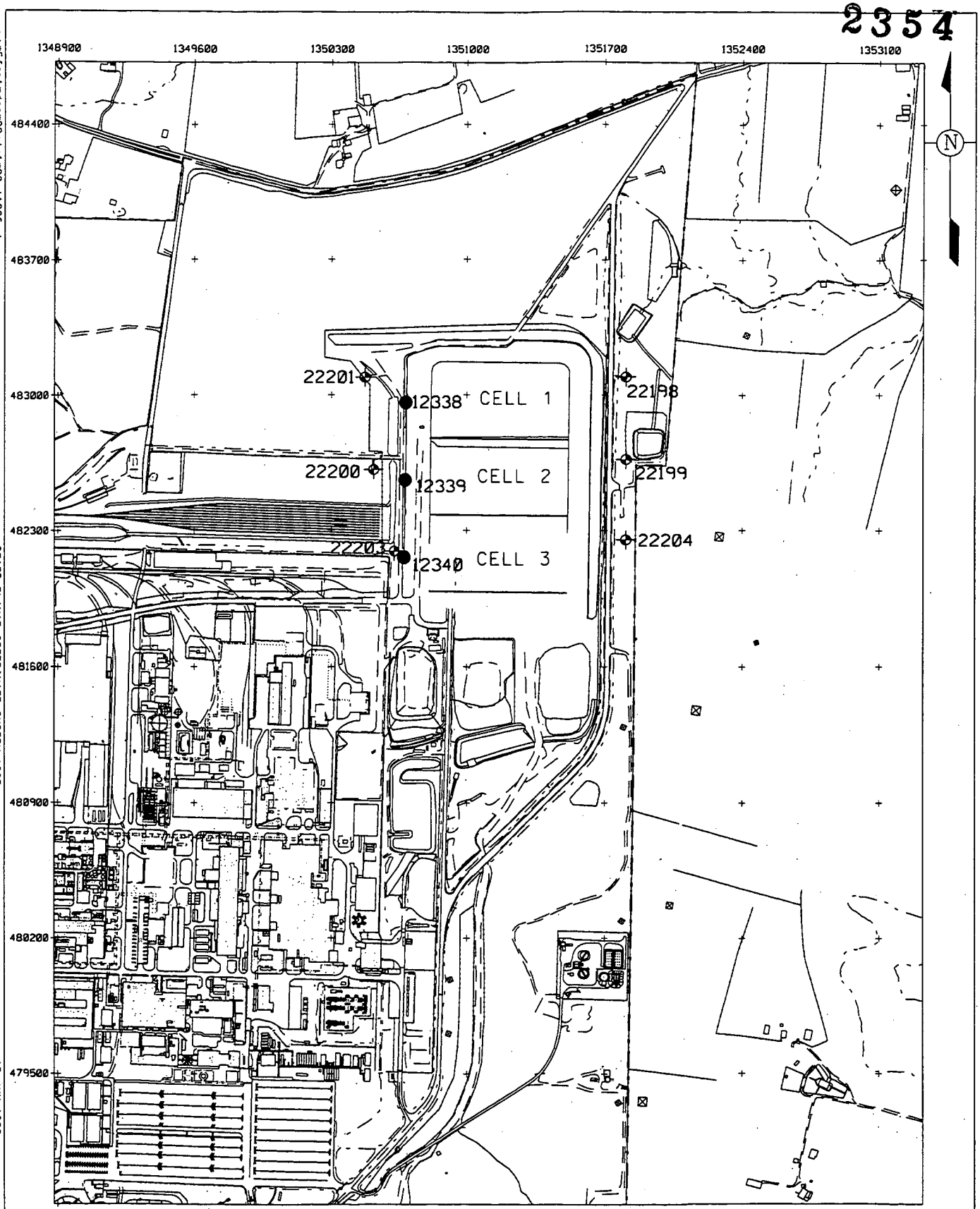
STATE PLANAR COORDINATE SYSTEM 1983

15-JUN-1999

000051

FIGURE 1-34. MODELED GROUNDWATER ELEVATIONS FOR JANUARY 1999 OPERATIONAL CONDITIONS



v:*5fg01*dg0*59gd1r1*59gd1006.dgn

STATE PLANAR COORDINATE SYSTEM 1983

15-JUN-1999

FIGURE 1-35. ON-SITE DISPOSAL FACILITY WELL LOCATIONS

FIGURE 1-36

GROUNDWATER SAMPLING ACTIVITIES COVERED IN THE NEXT QUARTERLY REPORT

SAMPLING ACTIVITIES	1999											
	First Quarter			Second Quarter			Third Quarter			Fourth Quarter		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
South Plume Module:												
Operational				♦	♦	♦						
Aquifer Conditions		♦										
South Field Extraction Module:												
Operational (Phase 1)				♦	♦	♦						
Aquifer Conditions			♦									
Re-Injection Demonstration Module[a]:												
Operational				♦	♦	♦						
Waste Storage Area Module:												
Aquifer Conditions												
Plant 6 Area Module:												
Aquifer Conditions												
Routine Water-Level/Flow Direction Monitoring				♦								
RCRA Property Boundary Monitoring	♦											
Private Well Monitoring	♦											
KC-2 Warehouse Monitoring												
OSDF Groundwater Monitoring:												
Cell 1		♦										
Cell 2		♦										
Cell 3	♦	♦	♦									

♦ Data summarized/evaluated in the next report

[a]Aquifer conditions for this module are monitored under the South Plume Module, South Field Module, RCRA Property Boundary Program, and Geoprobe® sampling results.

2.0 SURFACE WATER AND TREATED EFFLUENT UPDATE

2.1 INTRODUCTION

This section provides a status of the surface water and treated effluent monitoring for the first quarter of 1999. Figure 2-1 shows the data included in this section. Figure 2-2 identifies the surface water and treated effluent sample locations. Analytical results from the following routine monitoring program elements were utilized to complete the reporting requirements identified in Section 4.6.2 of the IEMP:

- National Pollutant Discharge Elimination System (NPDES) permit (data obtained from January through March 1999)
- Federal Facilities Compliance Agreement (FFCA) requirements (data obtained from January through March 1999).

2.2 FINDINGS

The principal findings from the reporting period are summarized below:

NPDES Permit Compliance

- Wastewater and storm water discharges from the Fernald Environmental Management Project (FEMP) were in compliance 99 percent of the time during the first quarter of 1999. A total of nine NPDES noncompliances occurred during the first quarter for total suspended solids, three in January, four in February, and two in March. All occurred at an internal monitoring point at the sewage treatment plant (STP 4601), and were related to the continuing difficulties in controlling total suspended solids in the sewage treatment process. Six of the noncompliances were exceedances of the daily maximum concentration and three were exceedances of the monthly average limit. These permit exceedances did not cause an exceedance at the Parshall Flume (PF 4001), which is the final effluent sample location prior to discharge into the Great Miami River. Therefore, none of these noncompliances had an adverse impact on the final discharge to the Great Miami River. The ongoing evaluation and appropriate actions to alleviate these total suspended solids exceedances are identified in the noncompliance reports which are sent to OEPA as required by the NPDES permit.
- The following construction activities occurred during the first quarter of 1999 which could have potentially impacted the water quality at various surface water sample locations (identified in parentheses):

  Excavation, screening, and hauling activities in the on-site disposal facility borrow area (SWD-02 and STRM 4003)

Initiation of locating and repairing leaks associated with the on-site disposal facility leachate conveyance system (SWD-02 and STRM 4003)

Construction activities associated with on-site disposal facility Cells 2 and 3 (SWD-02, STRM 4003, and PF 4001)

Construction activities associated with the Area 1, Phase II site preparation activities (SWD-02 and STRM 4003)

Construction activities associated with wetland mitigation in the Area 1, Phase I (STRM 4003 and SWD-01)

Preparation, conveyance, and loading of stock pile 6 to support Waste Pits Remedial Action Project (WPRAP) first loadout activities (STRM 4005)

Construction activities associated with the WPRAP (PF 4001 and STRM 4006)

Limited activities in the rail yard area (STRM 4006)

Construction activities associated with the roads and electrical upgrades portion of the Silos Infrastructure Project (STRM 4005)

Review of the surface water and treated effluent data provided with this report does not indicate that these activities have caused any significant final remediation level (FRL) or benchmark toxicity value (BTV) exceedances (identified in surveillance subsection). However, data will continue to be evaluated in light of ongoing remediation activities to assess impacts to the surface water pathway.

FFCA and Operable Unit 5 Record of Decision Compliance

- Figure 2-3 shows that a cumulative total of 80 pounds of uranium was discharged to the Great Miami River in effluent from January through March 1999. The Record of Decision for Remedial Actions at Operable Unit 5 (DOE 1996) established an annual discharge limit to the Great Miami River of 600 pounds for total uranium.

- Uncontrolled runoff also contributes to the amount of total uranium entering the environment. An estimated 6.25 pounds of total uranium are discharged to Paddys Run through uncontrolled runoff with every inch of rain. The 6.25 value was determined during the remedial investigation and prior to the initiation of remediation activities, and may result in conservative estimates of uranium mass in uncontrolled runoff. Figure 2-4 shows that precipitation during the first quarter of 1999 amounted to 10.99 inches; therefore, the mass of total uranium discharged to Paddys Run through uncontrolled runoff from January through March 1999 is estimated to be 68.69 pounds.

  DOE has initiated an evaluation of the assumption that 6.25 pounds of uranium is discharged to the environment through uncontrolled runoff with every inch of rain.

This evaluation will be based on the current drainage patterns and more recent analytical data collected at the discharge points into Paddys Run. The actual amount of uranium released through uncontrolled runoff is thought to be significantly less as a result of the removal of sources and the additional measures that have been taken to control runoff over the last several years.

- Figure 2-5 illustrates that the monthly average total uranium concentration limit of 20 µg/L for water discharged to the Great Miami River was not met during one month of the first quarter, specifically January. The average concentration for January was 26.1 µg/L. DOE formally notified the agencies of the exceedance in a letter dated February 11, 1999 (letter DOE-0423-99) from DOE to EPA and OEPA. The circumstances surrounding the January exceedance were discussed with EPA and OEPA during the weekly site conference calls in January and February. These circumstances are summarized below.

  The cause of this exceedance was partially due to eluate (with elevated total uranium concentrations) from frozen valves on the ion exchange resin regeneration system leaking into the Advance Wastewater Treatment Facility Phase II discharge header. The leaking valves were identified on January 6, 1999, and the situation controlled by January 11, 1999. However, the total uranium concentrations during this time (January 6 through 11) were well above normal at the Parshall Flume. Additionally, the total uranium concentrations at the sewage treatment plant were well above normal during January. Once discovered, the sewage treatment plant effluent was temporarily redirected during a portion of January to the Advanced Wastewater Treatment Facility Phase II. In addition, some extraction and re-injection wells were shut down during a portion of January to mitigate the higher total uranium concentrations occurring at the Parshall Flume.

- Table 2-1 and Figure 2-5 also illustrate that a treatment plant maintenance bypass event occurred during first quarter 1999, specifically March. As identified in the Operable Unit 5 Record of Decision, discharge concentrations which occur during treatment plant maintenance bypass days may be eliminated from the monthly average concentration. The average concentration for March was 18.5 µg/L after eliminating from the monthly average those concentrations observed during the two bypass days associated with treatment plant maintenance. The treatment plant maintenance bypass event occurred because Advanced Wastewater Treatment Facility Phase I, Phase II, and Expansion systems were taken off-line March 15 through March 17 to make Y2K compliance upgrades, replace two indicating transmitters, and replace a tank agitator. The agencies were formally notified prior to this treatment plant maintenance bypass event in accordance with the Operable Unit 5 Record of Decision.

- Figure 2-6 presents controlled and uncontrolled surface water flow areas for the first quarter of 1999. As identified in previous IEMP quarterly status reports, an evaluation of controlled areas is to occur at least quarterly in order to help ensure that the appropriate areas are being controlled.

000056

Surveillance Monitoring

- There were no FRL or BTV exceedances at any monitored location. Therefore, there were no FRL or BTV exceedances attributable to the FEMP in the Great Miami River.
- There were two locations that were dry during the first quarter of 1999. The locations were STRM 4003 and STRM 4004. Therefore, the quarterly total uranium samples from these locations were not collected.

Figure 2-7 shows the data from the surface water and treated effluent sampling activities that will be included in the next IEMP quarterly status report. The next quarterly status report will be submitted in September 1999. The report will contain NPDES and FFCA data from April through June 1999 (second quarter) and the results of the analytical data from the IEMP Characterization Program from January through March 1999 (first quarter).

2354

TABLE 2-1

1999 TREATMENT BYPASS EVENTS

Event	Duration (hours)	Number of Bypass Days[a]	Cumulative Number of Bypass Days	Total Uranium Discharged (pounds)	Total Water Discharged (millions of gallons)
Treatment Plant Maintenance Bypasses				(to Great Miami River)	(to Great Miami River)
March 15 through March 17	72	3	3	3.29	13.767

[a]Days are counted according to the definition provided in the Operations and Maintenance Master Plan for the Aquifer Restoration and Wastewater Treatment Project (DOE 1997d).

000058

FIGURE 2-1

SURFACE WATER AND TREATED EFFLUENT SAMPLING ACTIVITIES COVERED IN THIS QUARTERLY REPORT

SAMPLING ACTIVITIES	1999											
	First Quarter			Second Quarter			Third Quarter			Fourth Quarter		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
NPDES	♦	♦	♦									
FFCA	♦	♦	♦									
IEMP Characterization												

♦ Data summarized/ evaluated in this report

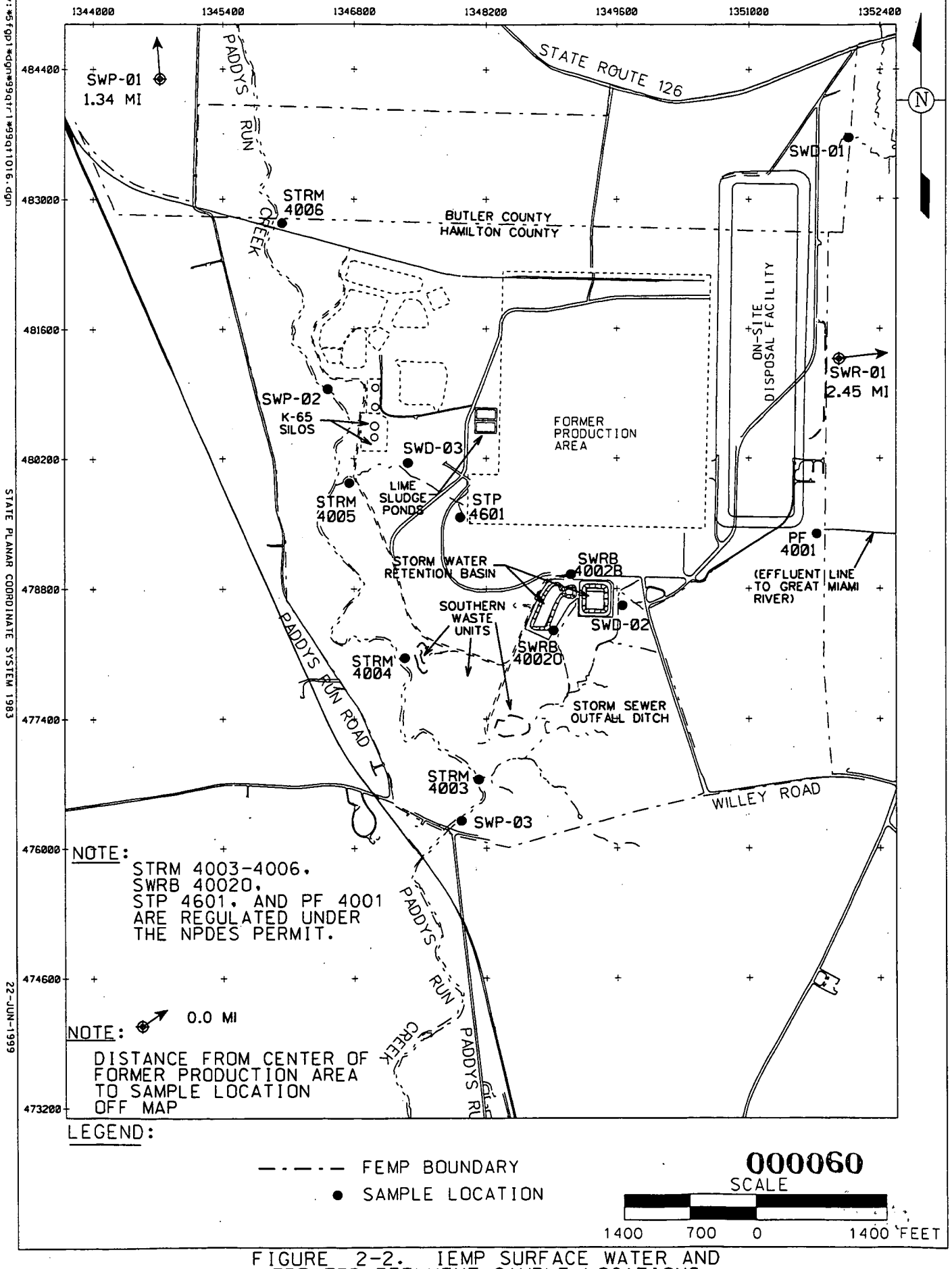


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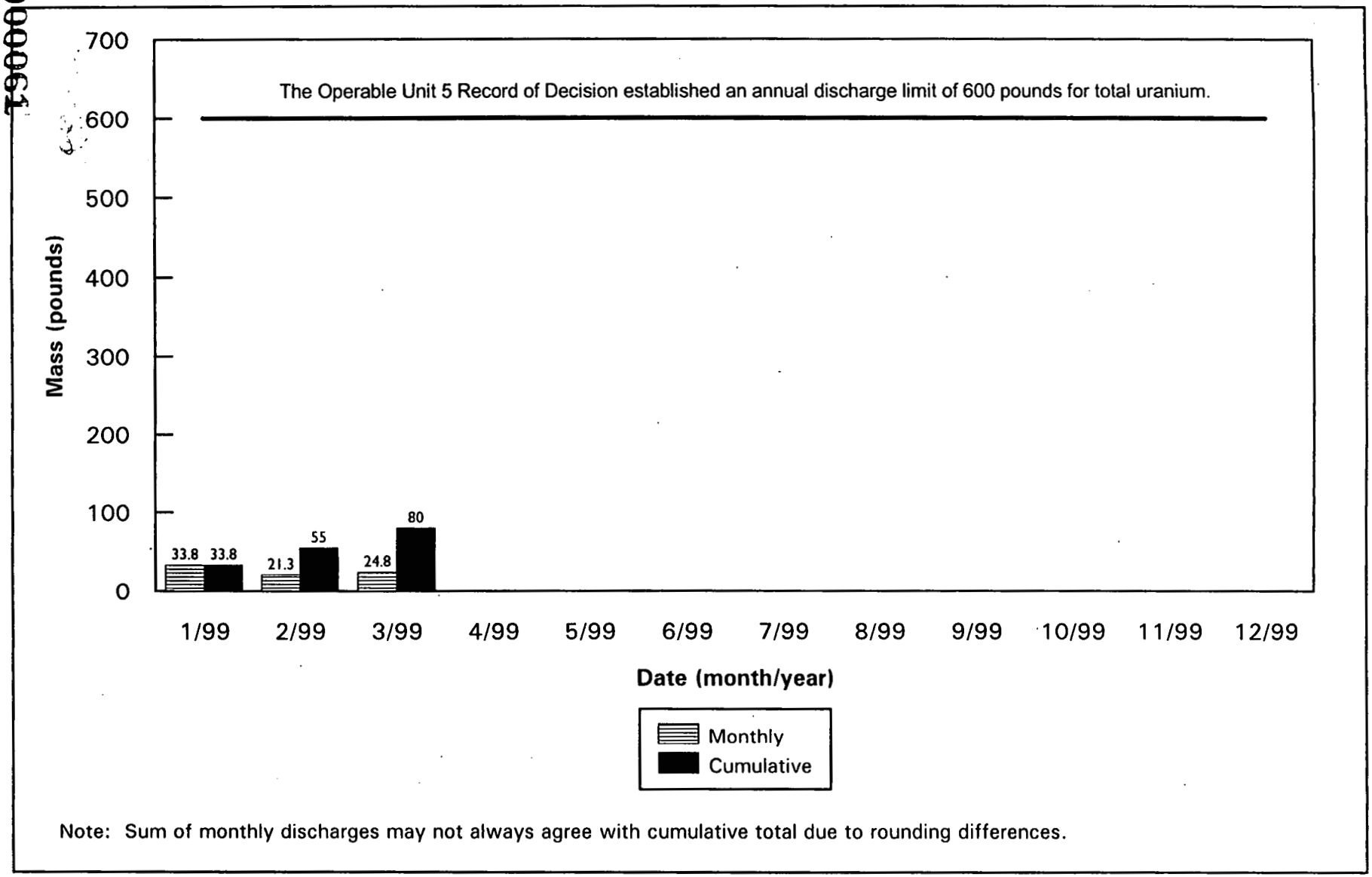
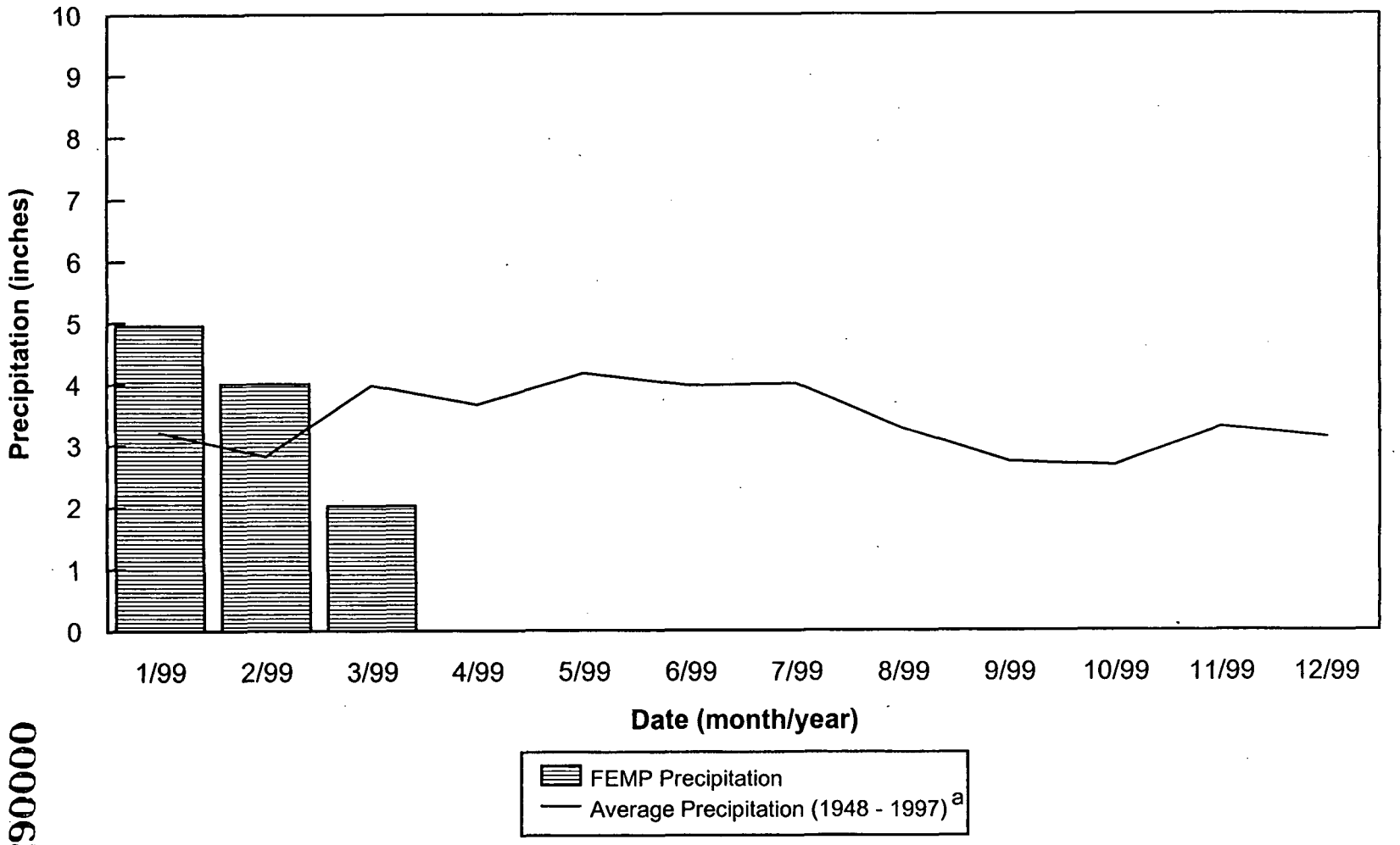
FIGURE 2-2. IEMP SURFACE WATER AND TREATED EFFLUENT SAMPLE LOCATIONS



Note: Sum of monthly discharges may not always agree with cumulative total due to rounding differences.

FIGURE 2-3. POUNDS OF URANIUM DISCHARGED TO THE GREAT MIAMI RIVER FROM THE PARSHALL FLUME (PF 4001) IN 1999



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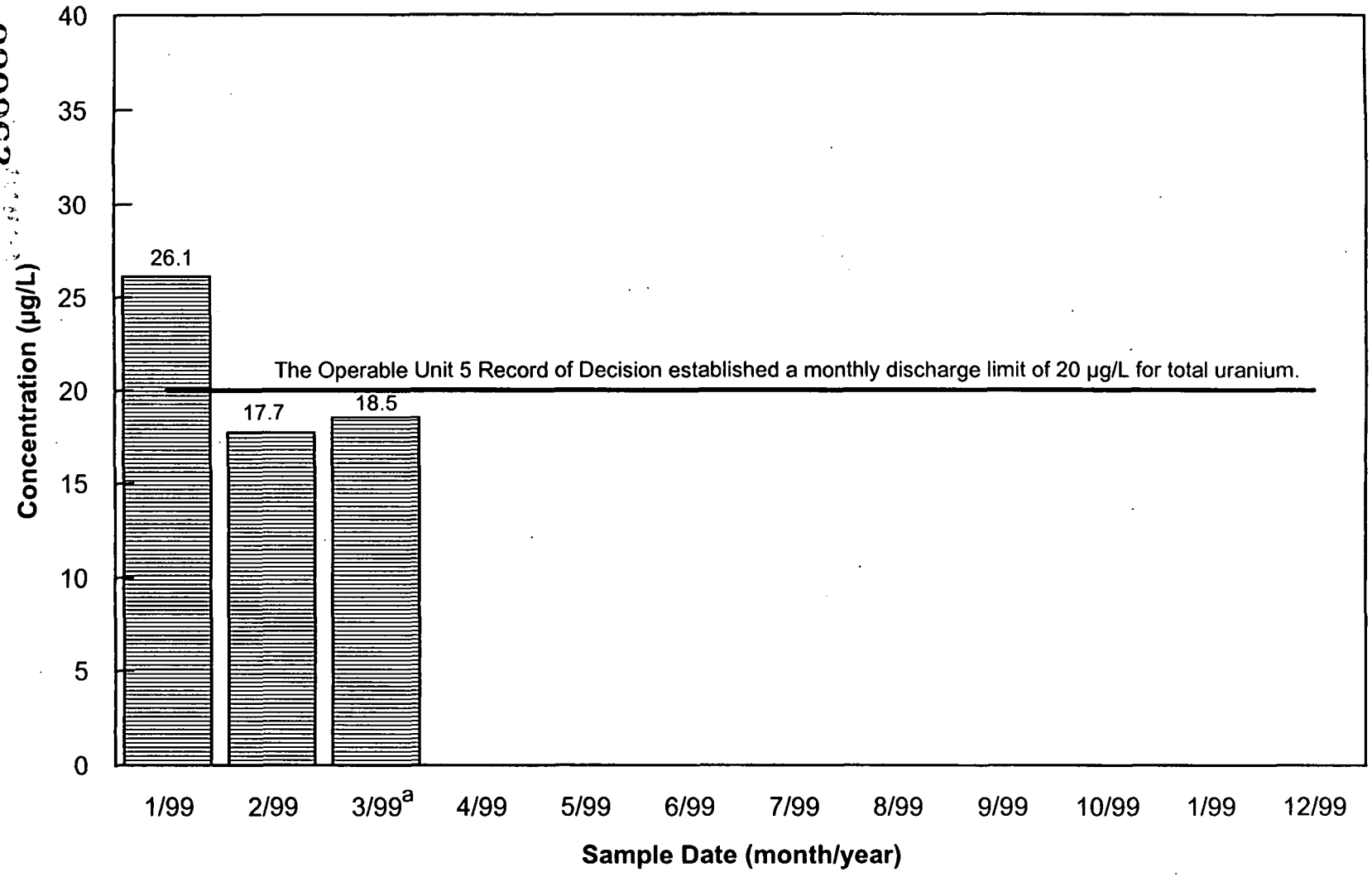
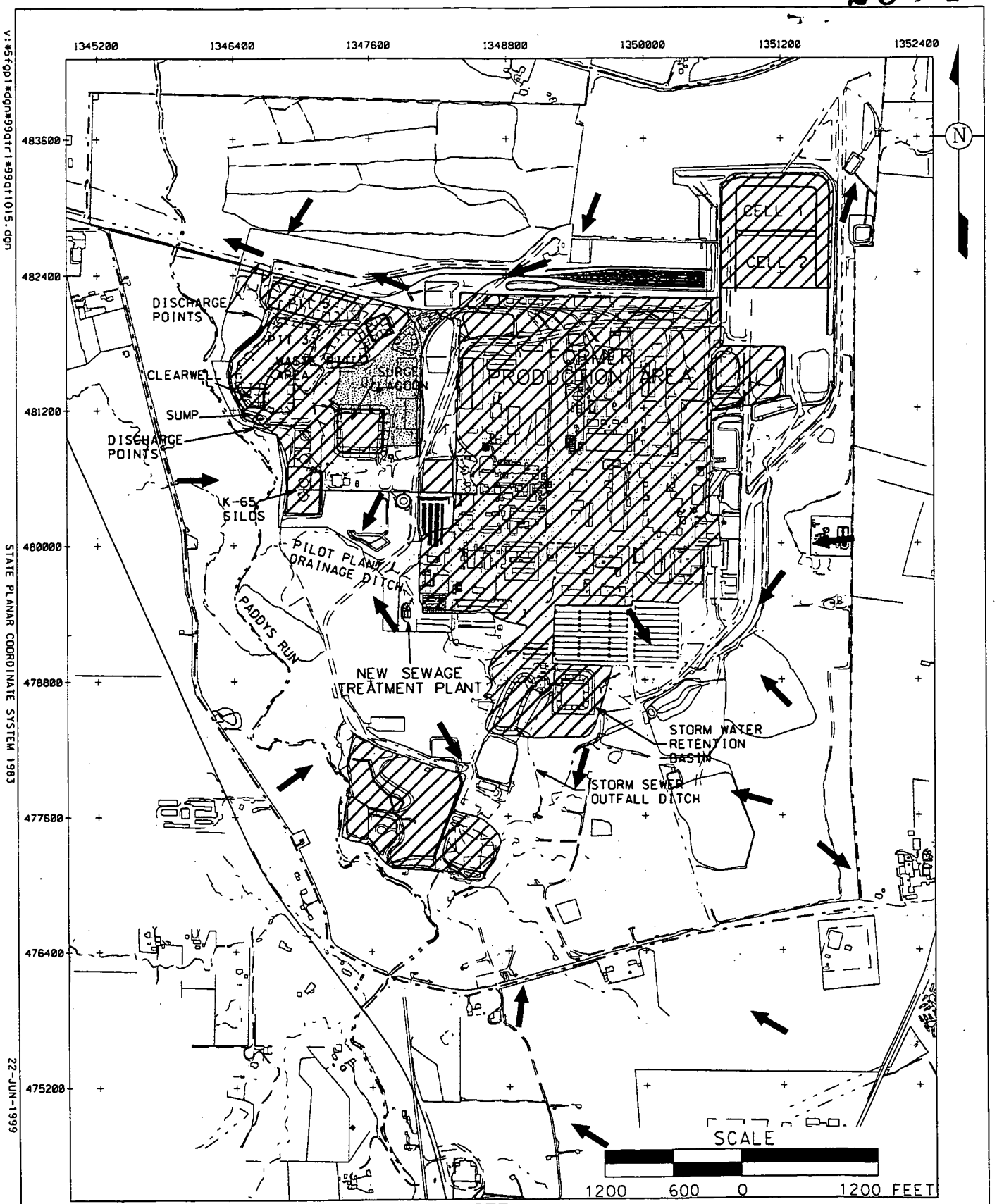
[a] Average precipitation is based on data collected at the Greater Cincinnati/Northern Kentucky International Airport.

FIGURE 2-4. 1999 FEMP MONTHLY PRECIPITATION DATA



a) Actual concentration was 19.4 µg/L. Eliminating the three "treatment plant maintenance" bypass days reduces average to 18.5 µg/L.

FIGURE 2-5. 1999 MONTHLY AVERAGE TOTAL URANIUM CONCENTRATION IN WATER DISCHARGED FROM THE PARSHALL FLUME (PF 4001) TO THE GREAT MIAMI RIVER



LEGEND:

- FEMP BOUNDARY
- CONTROLLED AREA
- UNCONTROLLED RUNOFF FLOW DIRECTION

NOTE:

CONTROLLED MEANS WATER IS COLLECTED AND SENT FOR TREATMENT AT THE AWWT.

- WATER TREATED IF TOTAL URANIUM RESULT IS >20 μg/L

FIGURE 2-6. CONTROLLED SURFACE WATER AREAS AND UNCONTROLLED FLOW DIRECTIONS FOR FIRST QUARTER 1999

FIGURE 2-7

SURFACE WATER AND TREATED EFFLUENT SAMPLING ACTIVITIES COVERED IN THE NEXT QUARTERLY REPORT

SAMPLING ACTIVITIES	1999											
	First Quarter			Second Quarter			Third Quarter			Fourth Quarter		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
NPDES				♦	♦	♦						
FFCA				♦	♦	♦						
IEMP Characterization	♦	♦	♦									

♦ Data summarized/ evaluated in the next report

3.0 AIR MONITORING UPDATE

3.1 INTRODUCTION

This section provides a summary of the first quarter 1999 monitoring activities and analytical results for the IEMP air monitoring program. Figure 3-1 shows the data included in this section. Analytical results from the following routine air monitoring program elements and project-specific air monitoring activities covered in this section include:

- Radiological Air Particulate Monitoring:
  - National Emissions Standards for Hazardous Air Pollutant (NESHAP) Compliance
  - Project-Specific Air Monitoring at the Thorium/Plant 9 Complex and Sewage Treatment Plant Complex
  - Air Particulate Monitoring Research Project
- Radon Monitoring:
  - Continuous Alpha Scintillation Monitoring - Silo Head Space and Environmental Data
- Direct Radiation Monitoring (via thermoluminescent dosimeters [TLDs])
- NESHAP Stack Emissions Monitoring.

3.2 FINDINGS

The principal findings from this reporting period are summarized below:

Radiological Air Particulate Monitoring

- First quarter 1999 uranium concentrations are comparable to fourth quarter 1998 uranium concentrations and, in general, reflect the shutdown of earth moving remediation projects during the winter months. Table 3-1 provides a summary of first quarter and historical total uranium concentrations. Late in the first quarter an increase in the total uranium concentration at AMS-2 was observed. The increase is attributable to the grading and contouring work associated with the wetland mitigation project in the vicinity of AMS-2.

  (Figure 3-2 identifies the location of the air monitoring stations and Figure 3-3 shows first quarter 1998 wind rose data.)

- As indicated in Figures 3-4 through 3-9, first quarter 1999 particulate concentrations are comparable to fourth quarter 1998 particulate concentrations and reflect the shutdown of earth moving remediation projects during the winter months. An increase in total particulate concentrations at AMS-2 occurred late in the first quarter. As noted earlier, the increase is attributable to the grading and contouring work associated with the wetland mitigation project in the vicinity of AMS-2. (Table 3-2 provides a summary of first quarter and historical total particulate concentrations.)

- During the first quarter, the electrical meters at several air monitors (AMS-7, AMS-27, WPTH-2, and AMS-6) along the western fenceline were damaged due to vandalism. During the repair and replacement of the meters, the air monitors were temporarily out of service resulting in a reduced number of operational hours recorded during the sampling period. All biweekly samples were collected, however, the percentage of air monitor operation at AMS-7 and AMS-27 was less than 95 percent during the first quarter of 1999. Assuming typical operations during the remainder of 1999, the annual percentage of operation at each of the affected monitors is expected to exceed 95 percent. Furthermore, to discourage future vandalism, a security cover was installed over the electric meters as an added measure of protection.

- As part of the air monitoring program changes implemented in the IEMP, Revision 1, two additional fenceline air monitoring locations were added to the IEMP radiological air particulate monitoring network late in the fourth quarter of 1998. The monitors, designated as WPTH-1 and WPTH-2 (refer to Figure 3-2), will be used to track fenceline thorium levels on a biweekly basis. These monitors were installed to address potential increases in airborne thorium concentrations, specifically thorium-230, resulting from fugitive emissions from the excavation of the waste pits which is scheduled to begin in mid-1999. Data from these monitors are plotted on Figures 3-10 and 3-11. Data collected prior to the initiation of pit excavations will serve as baseline monitoring data in future evaluations.

NESHAP Compliance

- The maximum first quarter effective dose equivalent, calculated from the first quarter air composite data, was 0.018 millirem (mrem) which occurred at AMS-9C. AMS-9C is located on the eastern fenceline of the site and generally downwind of the major remediation projects. This represents 0.18 percent of the 10 mrem NESHAP Subpart H standard. Table 3-3 contains the first quarter doses for each fenceline monitoring location and the fractional contribution of each radionuclide to the total dose.

- Evaluation of the data associated with the first quarter composite samples indicated that the off-site laboratory initially encountered interferences during the thorium analysis which resulted in low tracer recoveries. During re-analysis of the samples, thorium recoveries improved, but at several monitoring stations there was insufficient sample remaining for thorium re-analysis. When the first quarter data were validated, low thorium recoveries lead to rejection of the thorium data (thorium-228, thorium-230, and thorium-232 results) from three fenceline air monitoring stations (AMS-4,

AMS-22, and AMS-24) and the background monitors (AMS-12 and AMS-16). In order to account for background concentrations of thorium, first quarter 1998 data from AMS-12 and AMS-16 was substituted for the rejected 1999 background data in calculating dose estimates at the fenceline monitoring stations. Using the substituted data, uranium contributed approximately 80 percent of the dose at AMS-9C.

- On average, uranium contributed 81 percent of the dose at the fenceline monitors during the first quarter of 1999. This is consistent with historical data which indicates that uranium is the major contributor to dose from FEMP emissions. At AMS-25, where thorium contributed 75 percent of the 1998 annual dose, there was no measurable dose (above background) from thorium or uranium during the first quarter of 1999. At AMS-28, thorium-230 was the sole contributor to dose during the first quarter of 1999. However, as shown in Table 3-3, the dose contribution from thorium-230 is extremely small and dose contributions from all other radionuclides were below background levels. Notwithstanding the AMS-28 results, uranium continues to be the major contributor to dose from airborne emissions. No changes to the IEMP analytical program are proposed at this time.

Project-Specific Air Monitoring

- Project-specific radiological air monitoring activities initiated during October 1997 continued through February 5, 1999, to support the decontamination and dismantlement of the Thorium/Plant 9 Complex. The monitoring program included five project-specific air monitoring stations located near the project boundary that were monitored weekly for total uranium and total particulate concentrations. This monitoring program was conducted under the Operable Unit 3, Integrated Remedial Action, Thorium/Plant 9 Complex Implementation Plan for Above-Grade Decontamination and Dismantlement (DOE 1997c).

  First quarter results indicated a reduction in average total uranium concentrations from previous quarters. These reductions reflect the reduced work activities in the Thorium/Plant 9 Complex as the dismantlement project neared completion. More detailed environmental data from the Thorium/Plant 9 Complex dismantlement project is available in the Project Completion Report for Thorium/Plant 9 Complex Decontamination and Dismantlement Project (DOE 1999d).

- Project-specific environmental radiological air monitoring for the dismantlement of the Sewage Treatment Plant Complex continued through the first quarter 1999. This monitoring program, consisting of biweekly total uranium and total particulate measurements, is conducted under the Sewage Treatment Plant Complex Implementation Plan for Above-Grade Decontamination and Dismantlement (DOE 1998a). The project-specific air monitor, STP-1, was installed just south of the sewage treatment plant, between AMS-3 and AMS-29 (refer to Figure 3-2). The monitor was located so that no obstructions were present between the monitor and the dismantlement project.

  Average total uranium concentrations at STP-1 during the first quarter were lower than the 1998 annual average concentrations (refer to Table 3-1 and Figure 3-12). The

lower first quarter concentrations reflect the suspension of demolition activity during the winter months. This project monitor continues to operate and will remain in place until all excavation activities in the area of the sewage treatment plant have been completed.

Air Particulate Monitoring Research Project

- Due to mechanical problems, the DOE Environmental Measurements Laboratory (DOE-EML) air sampling equipment was out of service during the first quarter of 1999. DOE-EML repaired and tested the sampler during the first quarter. When returned to service (expected to occur in mid-1999), the sampler should further improve the detection limit of the DOE-EML analyses. Additional progress on this research project will be included in future IEMP quarterly status reports.

Radon Monitoring

- In January 1999, as part of the radon monitoring program changes implemented in the revised IEMP, AMS-11 was removed from service and a radon monitoring location (TS4) was added at building TS4 within the former production area (refer to Figure 3-13). Radon monitor TS4 is located within the area of model (ISCLT) predicted maximum on-site radon concentrations resulting from remediation activities associated with the waste pits and K-65 Silos 1 and 2.

- As expected, the highest continuous environmental radon monitoring results were recorded at the K-65 exclusion fence resulting from radon emissions from the K-65 Silos. In general there has been a gradual increase in radon levels recorded at the exclusion fence corresponding to the increase in the K-65 Silo head space concentrations. All four K-65 exclusion fence monitors recorded higher monthly average radon levels than the same monthly periods in 1998. Table 3-4 summarizes the first quarter 1999 and historical continuous environmental radon monitor concentration data. The maximum monthly average was 18.3 picoCuries per liter (pCi/L) and was recorded at location KNE in the prevailing wind direction.

- Recognizing that K-65 Silo head space radon concentrations fluctuate seasonally due to changes in physical parameters (i.e., temperature, barometric pressure, humidity, etc.), concentrations are summarized quarterly (from the daily average concentrations) in an attempt to identify changes under similar meteorological conditions (refer to Figure 3-14). First quarter 1999 monthly average continuous monitoring results for K-65 Silo 1 ranged between 12.9 and 13.4 million pCi/L. The quarterly average concentration increased approximately 17 percent over the quarterly average concentration during the same period in 1998 and is approximately 50 percent of the pre-bentonite concentration level (~26 million pCi/L). First quarter 1999 monthly average continuous monitoring results for K-65 Silo 2 ranged between 9.20 and 9.95 million pCi/L. The quarterly average concentration increased approximately seven percent over the average concentrations during the same period in 1998 and is approximately 32 percent of the pre-bentonite concentration level (~30 million pCi/L).

It should be noted that radon emissions from the K-65 Silos will be mitigated through implementation of the Accelerated Waste Retrieval Project which includes the construction of a radon control system for reducing radon concentrations in the silo head space. The radon control system is expected to be operational in 2001.

(Figure 3-14 shows the quarterly silo head space radon concentrations and Table 3-5 presents the monthly average silo head space radon concentrations.)

- During the first quarter of 1999, there were 23 exceedances of the DOE Order 5400.5 100 pCi/L radon limit recorded at the K-65 Silo exclusion fenceline (refer to Table 3-6). As previously documented, DOE has identified leaks in the silo domes and was considering interim measures to limit radon emissions until a new radon control system becomes operational during the Accelerated Waste Retrieval Project. During the first quarter, DOE decided to repair the foam covering on K-65 Silos 1 and 2 in areas identified to have elevated radon emissions. Repairs will be initiated during the second quarter of 1999.

Direct Radiation (TLD) Monitoring

- All monitoring results from direct radiation measurements for the first quarter of 1999 were within historical ranges (refer to Figure 3-15 for monitoring locations and Table 3-7 for direct radiation measurements). As noted in 1998 IEMP quarterly status reports, a positive trend in the immediate area of the K-65 Silos (locations 22 through 26) has been identified and will continue to be monitored (refer to Figure 3-16). This trend is attributed to a corresponding increase in radon-progeny concentrations observed in the K-65 Silo head space. The increase in direct radiation measurements adjacent to the silos is still well below the levels observed prior to the addition of bentonite to the silos in 1991.

  A slight positive trend at the site fenceline nearest the K-65 Silos (location 6) is attributed to the corresponding increase in radon head space concentrations. Figure 3-17 shows the slight positive trend at location 6, the fenceline location which is closest to the K-65 Silos.

NESHAP Stack Emissions Monitoring

- Based on an assessment and modeling of emissions from sample processing activity in the laboratory, continuous monitoring of Laboratory stack emissions is no longer necessary per NESHAP requirements. Therefore, monitoring of the Laboratory stack was discontinued during the first quarter of 1999. Continuous monitoring is required if the expected emissions from the stack could result in an effective dose equivalent of more than 0.1 mrem per year to the member of the general public. Based on CAP-88 modeling, emissions from the Laboratory stack are expected to result in an effective dose equivalent of less than 0.04 mrem per year to the member of the general public.

- First quarter 1999 results (refer to Table 3-8) for the Laundry stack are within expected ranges and no significant changes in the source operations associated with the stack were noted. First quarter 1999 results for the Building 71 stack are higher than

expected, yet no significant changes in the source operations associated with the stack were noted and no failures associated with the HEPA filter system on the stack were detected. Figure 3-18 identifies the NESHAP stack emissions monitoring locations.

Figure 3-19 shows the data from the air monitoring activities that will be included in the next IEMP quarterly status report. The next IEMP quarterly status report, to be issued in September 1999, will include data from air monitoring activities from April through June 1999 (second quarter). Monitoring activities defined under the IEMP for radiological particulate, radon, direct radiation, and stack monitoring will continue as planned during the second quarter of 1999.

TABLE 3-1

TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR

	First Quarter 1999 Results[b] (pCi/m³ x 1E-6)				1998 Summary Results[b] (pCi/m³ x 1E-6)				1990 through 1997 Summary Results[c,d] (pCi/m³ x 1E-6)	
Location[a]	No. of Samples	Min.	Max.	Avg.	No. of Samples	Min.	Max.	Avg.	Min.	Max.
Fenceline										
AMS-2	6	10	142	42	26	11	168	62	0	3500
AMS-3	6	26	91	50	26	27	760	202	0	17000
AMS-4	6	10	65	25	26	7.7	78	32	0	2300
AMS-5	6	0	30	17	26	0	118	42	0	4400
AMS-6	6	14	59	30	26	2.7	235	47	0	3200
AMS-7	6	6.3	40	21	26	2.4	105	36	0	7800
AMS-8A	6	26	74	46	26	7.9	338	116	10	900
AMS-9C[e]	6	23	104	49	26	5.7	562	129	0	431
AMS-22	6	19	49	38	26	3.0	101	34	0	29
AMS-23	6	0	47	20	26	9.0	194	44	9.8	53
AMS-24	6	0	44	13	26	0	65	28	106	NA
AMS-25	6	0	34	11	26	0	79	30	6.7	30
AMS-26	6	2.6	53	24	26	0	98	40	0	41
AMS-27	6	12	48	26	25[f]	5.3	64	31	0	30
AMS-28	6	4.9	28	14	26	2.6	216	30	0	29
AMS-29	6	0	45	19	26	2.6	121	45	0	76
Background										
AMS-12	6	7.8	20	12	26	0	107	14	0	480
AMS-16	6	7.8	33	22	26	0	35	18	0	350
Project-Specific										
STP-1[g]	6	27	143	66	14	38	891	301	NA	NA

[a]Refer to Figure 3-2
[b]For blank corrected concentrations less than or equal to 0.0 pCi/m³, the concentration is set as 0.0 pCi/m³.
[c]If the total number of samples is equal to one, then the data point is reported as the minimum.
[d]NA = not applicable
[e]Summary results for 1997 include AMS-9B/C data.
[f]One data point was not obtained due to a damaged filter.
[g]Project-specific monitor was not in operation prior to 1997.

000072

TABLE 3-2

TOTAL PARTICULATE CONCENTRATIONS IN AIR

Location[a]	First Quarter 1999 Results ($\mu g/m^3$)				1998 Summary Results ($\mu g/m^3$)				1990 through 1997 Summary Results[b,c] ($\mu g/m^3$)	
	No. of Samples	Min.	Max.	Avg.	No. of Samples	Min.	Max.	Avg.	Min.	Max.
Fenceline										
AMS-2	6	18	69	30	25[d]	14	49	30	7.0	77
AMS-3	6	19	24	20	26	13	52	32	8.0	159
AMS-4	6	18	39	27	26	16	79	37	13	69
AMS-5	6	20	32	25	26	9.6	54	30	11	62
AMS-6	6	19	24	22	26	16	54	33	8.0	69
AMS-7	6	22	30	25	26	6.8	60	33	13	76
AMS-8A	6	20	24	22	26	13	64	34	18	89
AMS-9C[e]	6	19	27	23	26	15	65	36	7.1	136
AMS-22	6	16	45	35	26	13	57	34	21	30
AMS-23	6	19	23	21	26	15	51	30	22	28
AMS-24	6	22	26	24	26	18	79	42	74	NA
AMS-25	6	17	26	22	26	21	69	40	26	40
AMS-26	6	21	28	25	26	15	51	31	20	23
AMS-27	6	30	49	37	26	24	86	46	33	49
AMS-28	6	15	18	17	26	12	49	28	16	30
AMS-29	6	18	24	21	26	11	62	32	19	30
Background										
AMS-12[f]	6	16	24	19	26	12	47	28	6.0	416
AMS-16[f]	6	26	47	35	26	18	84	50	22	79
Project-Specific										
STP-1[g]	6	21	30	24	14	25	93	43	NA	NA

[a]Refer to Figure 3-2
[b]If the total number of samples is equal to one, then the data point is reported as the minimum.
[c]NA = not applicable
[d]One data point was not obtained due to a damaged filter.
[e]Summary results for 1997 include AMS-9B/C data.
[f]Total particulate analysis was discontinued during 1994 and was reinstated for AMS-12 and AMS-16 in 1997.
[g]Project-specific monitor was not in operation prior to 1997.

000073

TABLE 3-3

FIRST QUARTER NESHAP COMPLIANCE TRACKING

	40 CFR 61 (NESHAP) Subpart H Appendix E, Table 2; Net Ratios[b]													
Location[a]	Actinium-228[c]	Radium-224[c]	Radium-226[d]	Radium-228[c]	Thorium-228	Thorium-230	Thorium-231[c]	Thorium-232	Thorium-234[c]	Uranium-234	Uranium-235 Uranium-236	Uranium-238	Ratio Totals	Dose[e] (mrem)
Fenceline														
AMS-2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E-10	0.0E+00	1.0E-06	2.0E-04	1.9E-05	2.8E-04	5.0E-04	0.005
AMS-3	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.1E-06	4.9E-04	0.0E+00	5.6E-04	1.0E-03	0.010
AMS-4	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00[f]	0.0E+00[f]	2.7E-10	0.0E+00[f]	4.6E-07	2.0E-05	1.1E-05	1.2E-04	1.5E-04	0.002
AMS-5	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-07	0.0E+00	0.0E+00	4.5E-05	4.5E-05	0.000
AMS-6	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.9E-10	0.0E+00	7.5E-07	2.2E-04	1.5E-05	2.0E-04	4.3E-04	0.004
AMS-7	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.0E-06	3.1E-04	0.0E+00	2.6E-04	5.7E-04	0.006
AMS-8A	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-06	4.5E-04	0.0E+00	4.6E-04	9.1E-04	0.009
AMS-9C	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.5E-04	4.0E-10	0.0E+00	2.6E-06	7.2E-04	1.6E-05	6.8E-04	1.8E-03	0.018
AMS-22	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00[f]	0.0E+00[f]	2.8E-10	0.0E+00[f]	2.7E-06	5.1E-04	1.1E-05	7.1E-04	1.2E-03	0.012
AMS-23	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E-04	0.0E+00	0.0E+00	4.8E-07	1.4E-04	0.0E+00	1.3E-04	5.9E-04	0.006
AMS-24	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00[f]	0.0E+00[f]	2.3E-10	0.0E+00[f]	0.0E+00	0.0E+00	9.2E-06	0.0E+00	9.2E-06	0.000
AMS-25	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.000
AMS-26	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-10	0.0E+00	9.7E-07	1.8E-04	6.5E-06	2.6E-04	4.4E-04	0.004
AMS-27	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.7E-04	0.0E+00	0.0E+00	5.9E-07	1.4E-04	0.0E+00	1.6E-04	4.7E-04	0.005
AMS-28	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.1E-05	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	7.1E-05	0.001
AMS-29	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.6E-04	0.0E+00	0.0E+00	7.2E-09	5.4E-05	0.0E+00	1.9E-06	2.1E-04	0.002
Background														
AMS-12	1.7E-07	4.3E-06	0.0E+00	1.1E-04	2.6E-04[g]	3.3E-04[g]	5.8E-10	1.0E-03[g]	8.4E-07	3.0E-04	2.3E-05	2.2E-04	NA[h]	
AMS-16	5.5E-07	1.3E-05	8.3E-04	3.4E-04	7.1E-04[g]	7.9E-04[g]	0.0E+00	3.3E-03[g]	1.7E-06	4.7E-04	0.0E+00	4.4E-04	NA[h]	

Maximum Quarterly Ratio: 0.0018
Maximum Quarterly Dose (mrem): 0.018

[a]Refer to Figure 3-2
[b]A ratio of 0.0+00 indicates the filter results were less than or equal to the blank results, and/or the indicator concentrations were less than or equal to the average net background concentrations.
[c]Isotopes assumed to be in equilibrium with their parents.
[d]Radium-226 data have not been validated.
[e]Dose conversions are based on the NESHAP standard of 10 mrem per year.
[f]Through the validation process, thorium data were rejected due to low tracer recoveries. Rejected data were not used in dose calculations.
[g]First Quarter 1998 thorium data were substituted for rejected first quarter 1999 data.
[h]NA = not applicable

TABLE 3-4

CONTINUOUS ENVIRONMENTAL RADON MONITORING MONTHLY AVERAGE CONCENTRATIONS

	First Quarter 1999 Monthly Results[b] (Instrument Background Corrected) (pCi/L)			First Quarter 1998 Monthly Results[b,c] (Instrument Background Corrected) (pCi/L)			1998 Summary Results[b,c] (Instrument Background Corrected) (pCi/L)		
Location[a]	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
Fenceline									
AMS-02	0.3	0.4	0.4	0.1	0.3	0.2	0.2	0.7	0.4
AMS-03	0.1	0.2	0.2	NA	NA	NA	0.6	0.8	0.7
AMS-04	0.1	0.2	0.1	0.1	0.3	0.2	0.1	0.7	0.4
AMS-05	0.2	0.3	0.3	0.3	0.4	0.4	0.2	1.3	0.6
AMS-06	0.2	0.3	0.3	0.2	0.3	0.3	0.2	0.9	0.5
AMS-07	0.3	0.5	0.4	0.2	0.3	0.3	0.2	1.5	0.7
AMS-08A[d]	0.3	0.8	0.6	NA	NA	NA	0.8	NA	NA
AMS-09C	0.4	0.7	0.5	NA	NA	NA	0.2	0.9	0.6
AMS-22	0.1	0.2	0.2	NA	NA	NA	0.2	0.7	0.4
AMS-23	0.2	0.3	0.2	NA	NA	NA	0.4	0.5	0.4
AMS-24[d]	0.2	0.3	0.3	NA	NA	NA	0.7	NA	NA
AMS-25[d]	0.2	0.3	0.3	NA	NA	NA	0.6	NA	NA
AMS-26	0.2	0.5	0.3	NA	NA	NA	0.2	0.8	0.6
AMS-27	0.2	0.3	0.2	NA	NA	NA	0.2	1.1	0.7
AMS-28[d]	0.1	0.1	0.1	NA	NA	NA	0.4	NA	NA
AMS-29[d]	0.1	0.3	0.2	NA	NA	NA	0.7	NA	NA
Background									
AMS-12	0.1	0.3	0.2	0.1	0.1	0.1	0.1	0.6	0.3
AMS-16	0.1	0.2	0.1	0.3	0.3	0.3	0.2	0.6	0.4
On Site									
KNE	7.8	18.3	12.8	2.0	4.8	3.8	2.0	18.2	9.1
KNW	2.7	4.0	3.4	1.2	2.5	1.8	1.0	4.8	2.4
KSE	4.7	9.9	6.8	2.4	4.6	3.9	2.4	16.9	8.3
KSW	3.3	4.1	3.6	2.4	4.0	3.2	1.4	5.2	3.1
KTOP	11.0	15.8	13.2	7.2	12	9.1	7.2	24.6	13.0
Pilot Plant Warehouse	0.3	0.4	0.3	0.0	0.2	0.1	0.1	0.9	0.4
Rally Point 4	0.6	1.3	0.9	0.2	0.5	0.4	0.2	1.3	0.7
Surge Lagoon	0.4	0.5	0.4	0.1	0.5	0.3	0.3	1.3	0.7
T28	1.5	1.6	1.5	0.9	1.6	1.2	0.9	2.8	1.8
TS4[e]	0.2	0.5	0.3	NA	NA	NA	NA	NA	NA
WP-17A	0.1	0.2	0.2	0.2	0.4	0.3	0.2	0.9	0.5

[a]Refer to Figure 3-13
[b]Instrument background changes as monitors are replaced.
[c]NA = not applicable
[d]Unit was placed in service in December 1998.
[e]Unit was placed in service in January 1999.

000075

TABLE 3-5

RADON HEAD SPACE CONCENTRATIONS

	Radon Head Space Concentrations[a,b,c] (pCi/L)											
	Silo 1 1999			Silo 1 1998			Silo 2 1999			Silo 2 1998		
Month	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.	Min.	Max.	Avg.
January	1.24E+07	1.44E+07	1.34E+07	1.06E+07	1.18E+07	1.13E+07	8.78E+06	1.11E+07	9.95E+06	8.24E+06	1.01E+07	9.10E+06
February	1.27E+07	1.35E+07	1.32E+07	1.06E+07	1.18E+07	1.12E+07	8.70E+06	9.68E+06	9.20E+06	8.02E+06	9.48E+06	8.96E+06
March	1.25E+07	1.33E+07	1.29E+07	1.01E+07	1.17E+07	1.10E+07	8.66E+06	9.89E+06	9.30E+06	7.27E+06	9.19E+06	8.45E+06

[a]Minimum equals minimum recorded daily average radon concentration.
[b]Maximum equals maximum recorded daily average radon concentration.
[c]Average equals monthly average of recorded daily radon concentrations.

TABLE 3-6

1999 FIRST QUARTER RADON CONCENTRATIONS
100 pCi/L EXCEEDANCES AT THE K-65 SILOS 1 AND 2 EXCLUSION FENCE

Exceedance Event Start Date	Duration of Exceedance (hours)	Maximum Recorded Hourly Radon Concentration (pCi/L)	Effected Monitoring Location(s)[a,b]
1/11	1	192	KNE
1/25	3	133	KNE
1/26	1	103	KNE
1/26	1	102	KNW
2/3	3	237	KNE, KSE
2/5	1	141	KNE
2/6	4	231	KNE, KSE
2/8	4	295	KNE, KSE
2/14	3	207	KNE
2/18	2	228	KNE
2/26	2	188	KNE
2/26	3	175	KNE, KSE
3/4	2	291	KNE
3/10	1	151	KNE
3/15	6	379	KNE, KSE
3/20	3	158	KNE
3/20	7	171	KNE, KSE
3/23	1	104	KNE
3/24	3	174	KNE
3/27	2	184	KNE
3/27	4	183	KNE
3/29	2	170	KNE, KSE
3/30	7	256	KNE, KSE

[a]The location listed first had the highest recorded concentration.
[b]Refer to Figure 3-13

000077

2354

TABLE 3-7

DIRECT RADIATION (TLD) MEASUREMENTS

Location[a]	Direct Radiation (mrem) First Quarter 1999 Results	1998 Summary Results
Fenceline		
2	18	74
3	16	67
4	16	66
5	17	68
6	20	84
7	17	69
8A	17	75
9C	18	79
13	18	74
14	17	77
15	19	79
16	19	81
17	16	73
34	18	75
35	17	70
36	16	65
37	18	77
38	16	63
39	19	79
40	16	67
41	18	73
Min.	**16**	**63**
Max.	**20**	**84**
On Site		
22	207	776
23	230	817
24	152	632[b]
25	206	698
26	128	496
32	14	55
Min.	**14**	**55**
Max.	**230**	**817**
Background		
18	19	77
19	16	65
20	15	61
27	15	64
33	17	68
Min.	**15**	**61**
Max.	**19**	**77**

[a]Refer to Figure 3-15
[b]Direct radiation value includes estimated second quarter results which were based on first quarter results.

000078

TABLE 3-8

NESHAP STACK EMISSION MONITORING RESULTS

	First Quarter 1999 Results		1998 Summary Results	
Analysis Performed	No. of Samples	Total Pounds[a,b]	No. of Samples	Total Pounds[a]
Building 71 Stack				
Uranium, Total	1	2.2E-05	5	1.3E-05
Thorium-232	1	2.5E-05	5	8.6E-05
Thorium-230	1	2.4E-10	5	1.2E-09
Total Particulate	1	5.1E-03	1[c]	7.2E-02
Laundry Stack				
Uranium, Total	2	ND	10	7.0E-06
Thorium-232	2	1.6E-04	10	4.5E-04
Thorium-230	2	1.7E-09	10	5.8E-09
Total Particulate	2	8.8E-02	8[c]	1.1E+00

[a]Total pounds are only determined from detected results.
[b]ND = non-detectable
[c]Total particulate result(s) could not be determined due to a damaged filter(s).

000079

FIGURE 3-1

AIR SAMPLING ACTIVITIES COVERED IN THIS QUARTERLY REPORT

SAMPLING ACTIVITIES	1999											
	First Quarter			Second Quarter			Third Quarter			Fourth Quarter		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Radiological Particulate Monitoring:	♦	♦	♦									
NESHAP Quarterly Composite			♦									
Radon Monitoring - Continuous Alpha Scintillation Monitors	♦	♦	♦									
Direct Radiation (TLD) Monitoring			♦									
NESHAP Stack Emissions Monitoring	♦	♦	♦									

♦ Data summarized/ evaluated in the next report

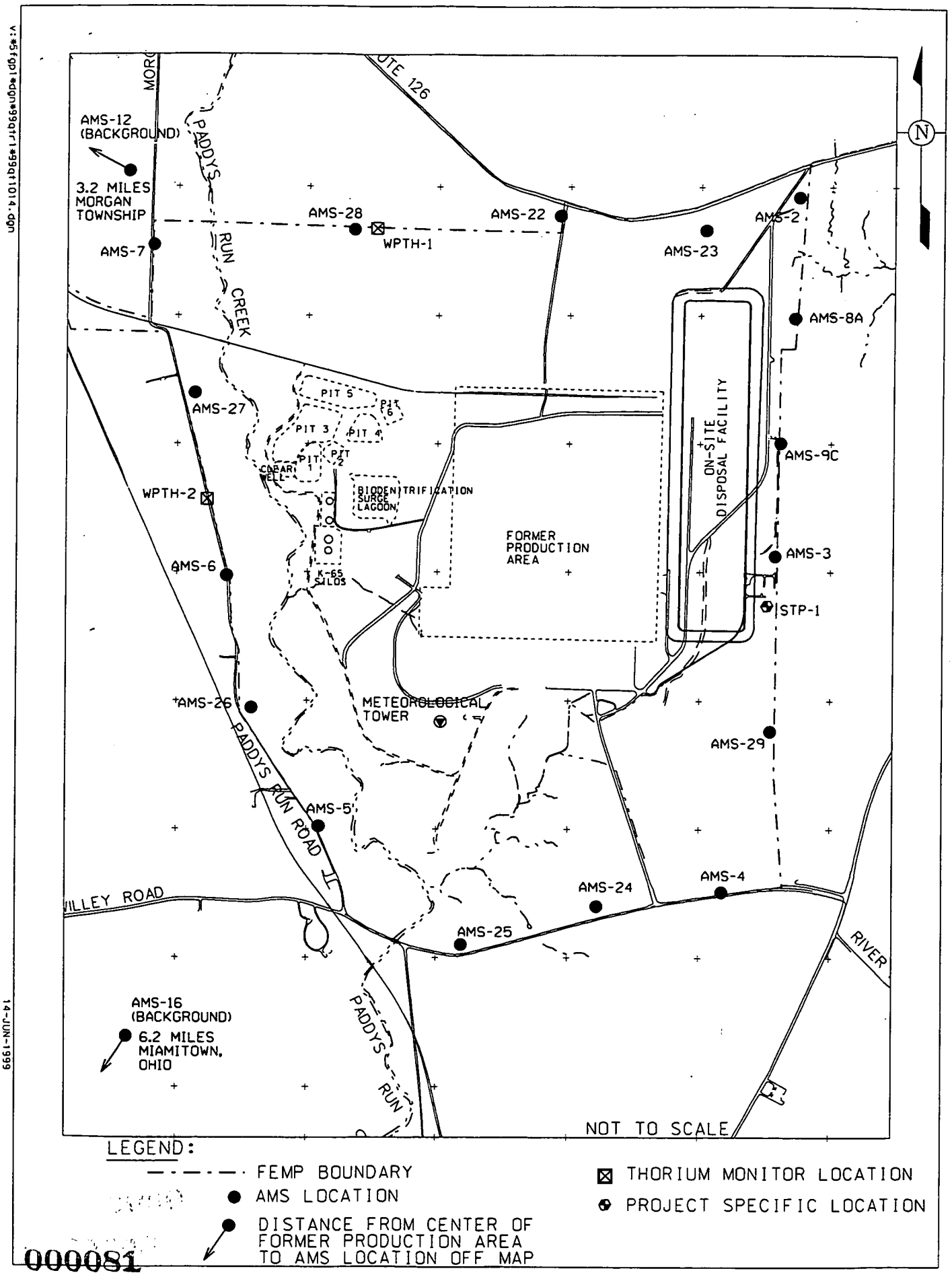


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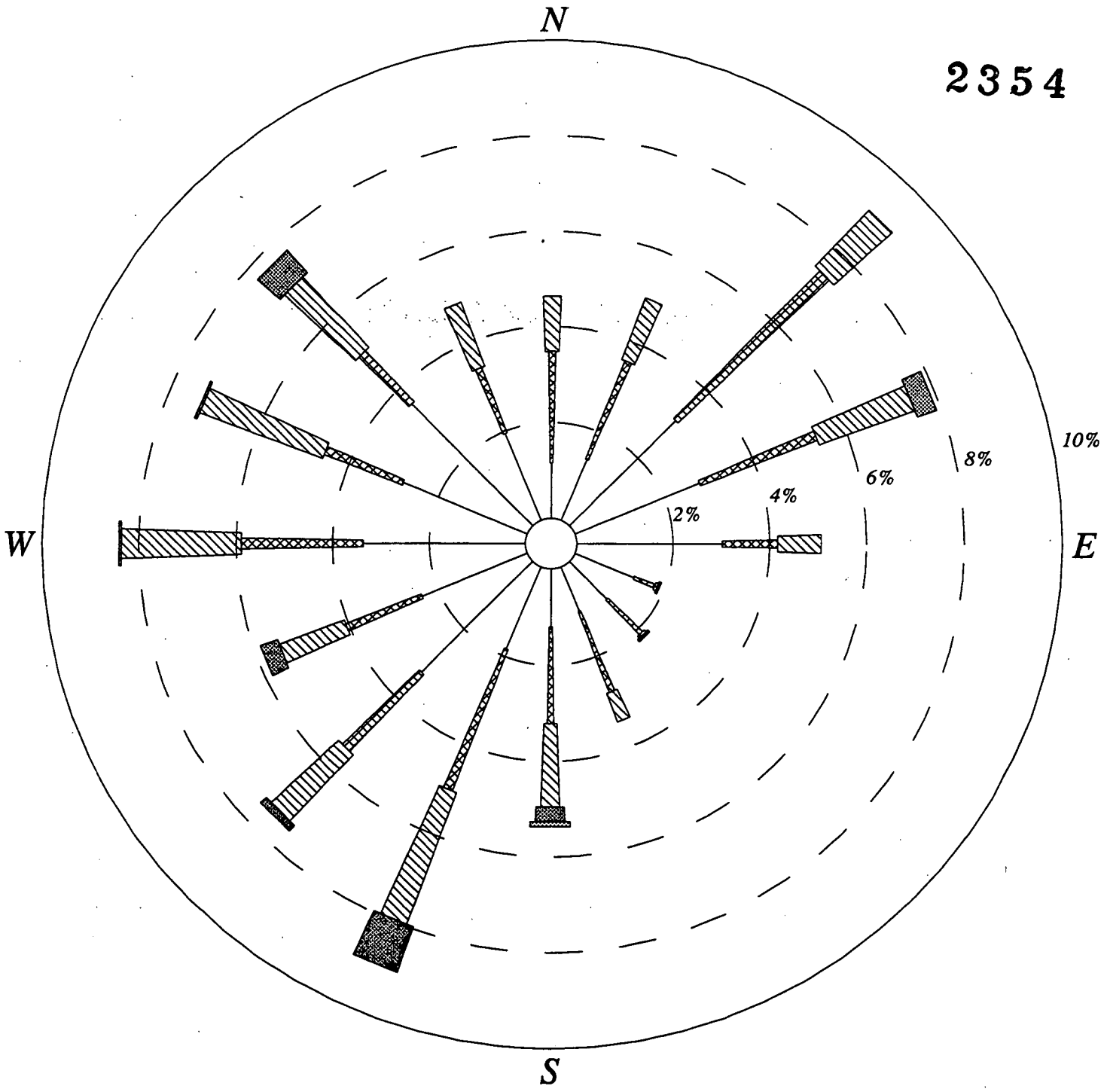
FIGURE 3-2. IEMP AIR MONITORING LOCATIONS



CALM WINDS 4.85%

WIND SPEED (KNOTS)

NOTE: Frequencies indicate direction from which the wind is blowing.

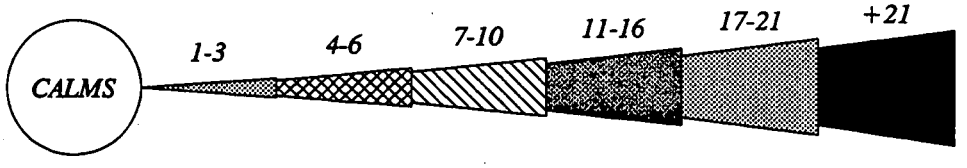


FIGURE 3-3. FIRST QUARTER 1999 WIND ROSE DATA, 10-METER HEIGHT

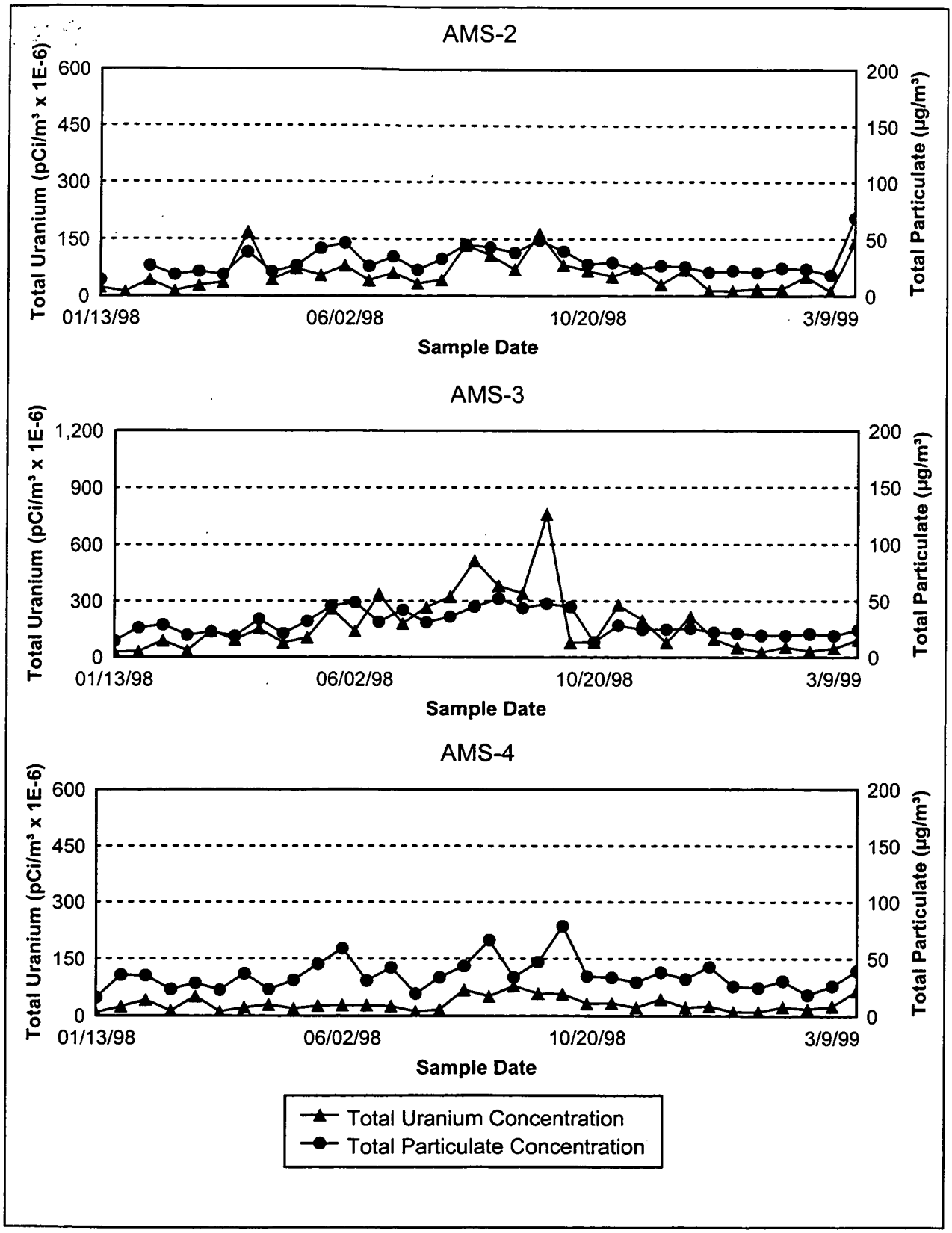


FIGURE 3-4. TOTAL URANIUM AND PARTICULATE CONCENTRATIONS IN AIR (AMS-2, AMS-3, AND AMS-4)

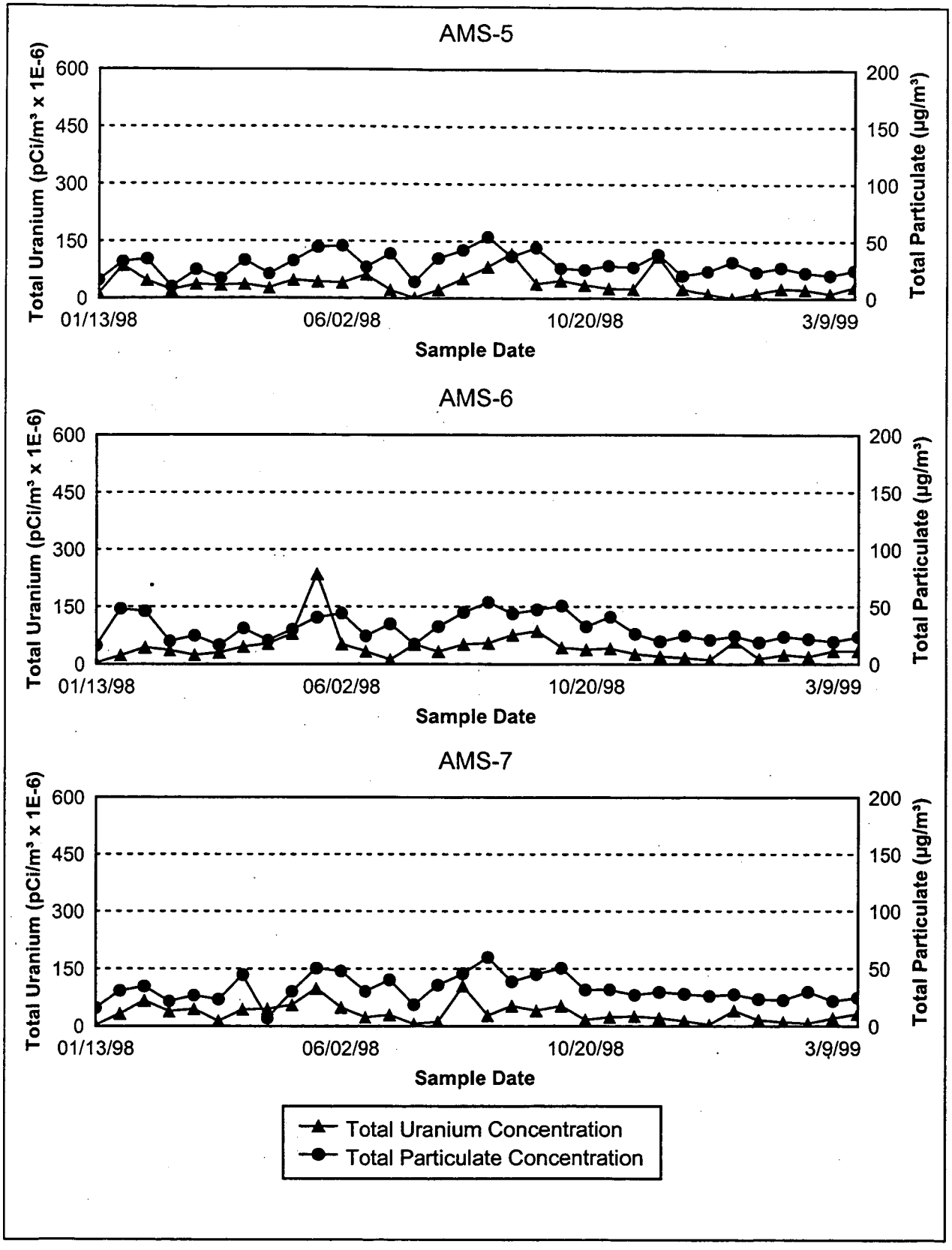


FIGURE 3-5. TOTAL URANIUM AND PARTICULATE CONCENTRATIONS IN AIR (AMS-5, AMS-6, AND AMS-7)

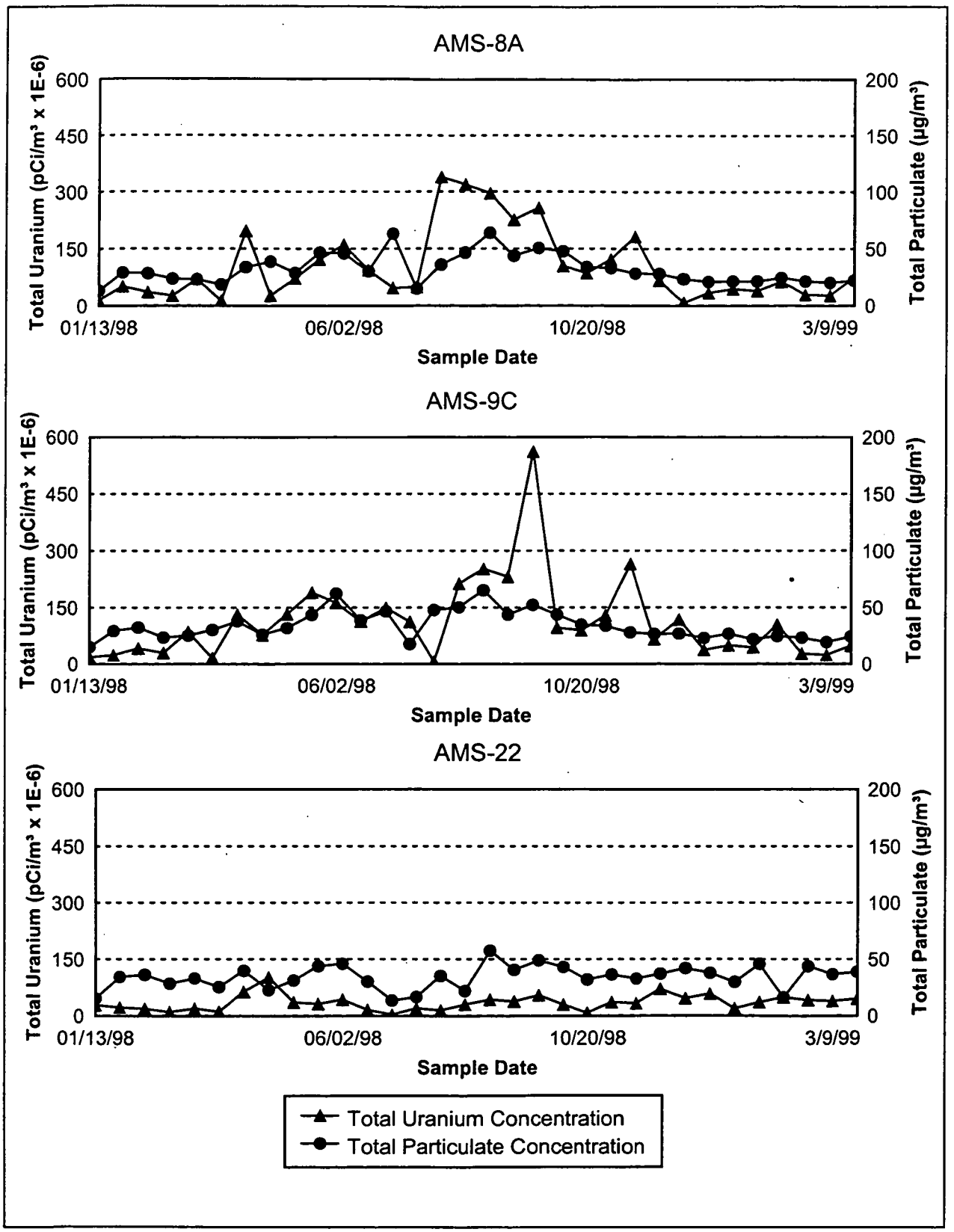


FIGURE 3-6. TOTAL URANIUM AND PARTICULATE CONCENTRATIONS IN AIR (AMS-8A, AMS-9C, AND AMS-22)

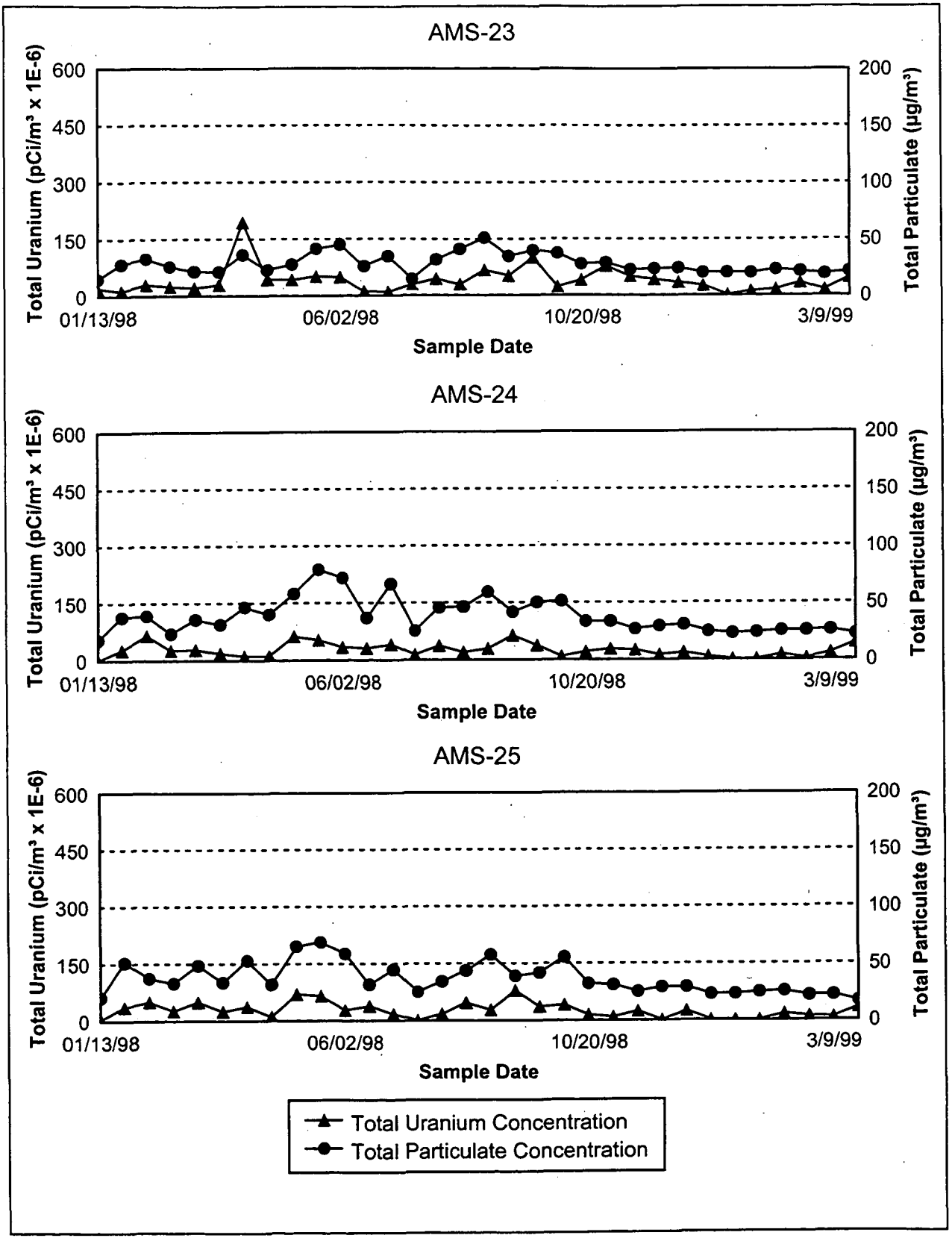


FIGURE 3-7. TOTAL URANIUM AND PARTICULATE CONCENTRATIONS IN AIR (AMS-23, AMS-24, AND AMS-25)

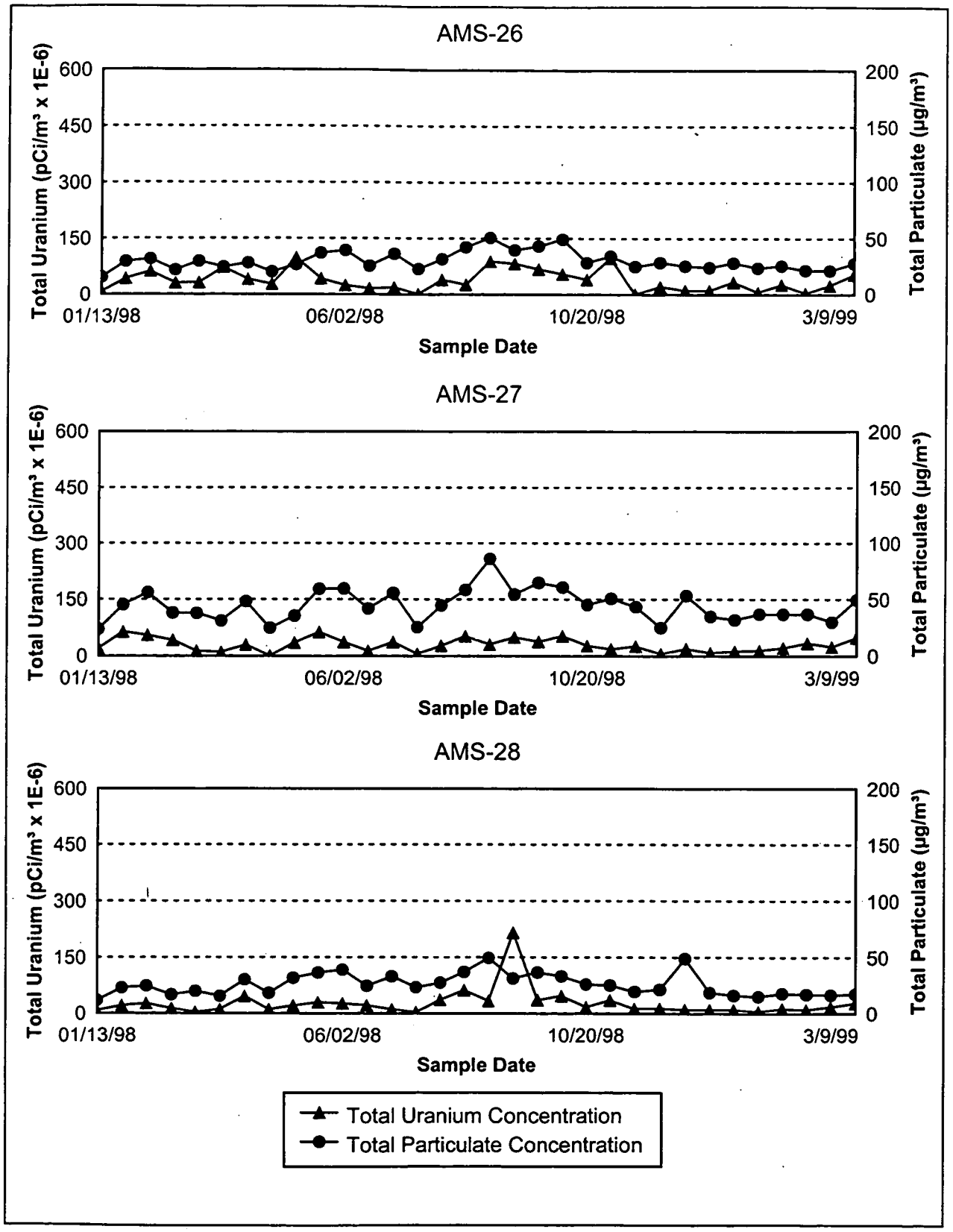


FIGURE 3-8. TOTAL URANIUM AND PARTICULATE CONCENTRATIONS IN AIR (AMS-26, AMS-27, AND AMS-28)

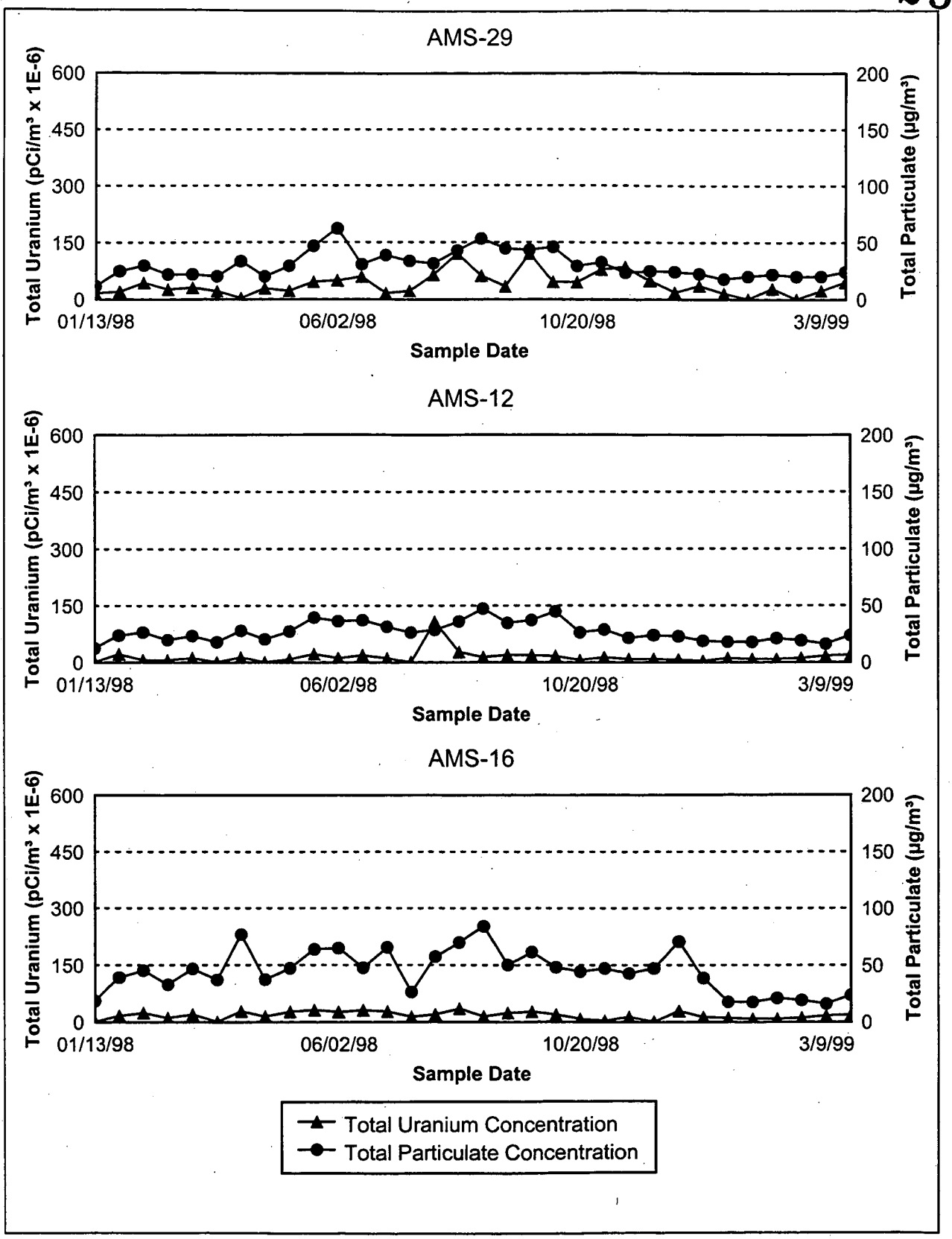


FIGURE 3-9. TOTAL URANIUM AND PARTICULATE CONCENTRATIONS IN AIR (AMS-29, AMS-12, AND AMS-16)

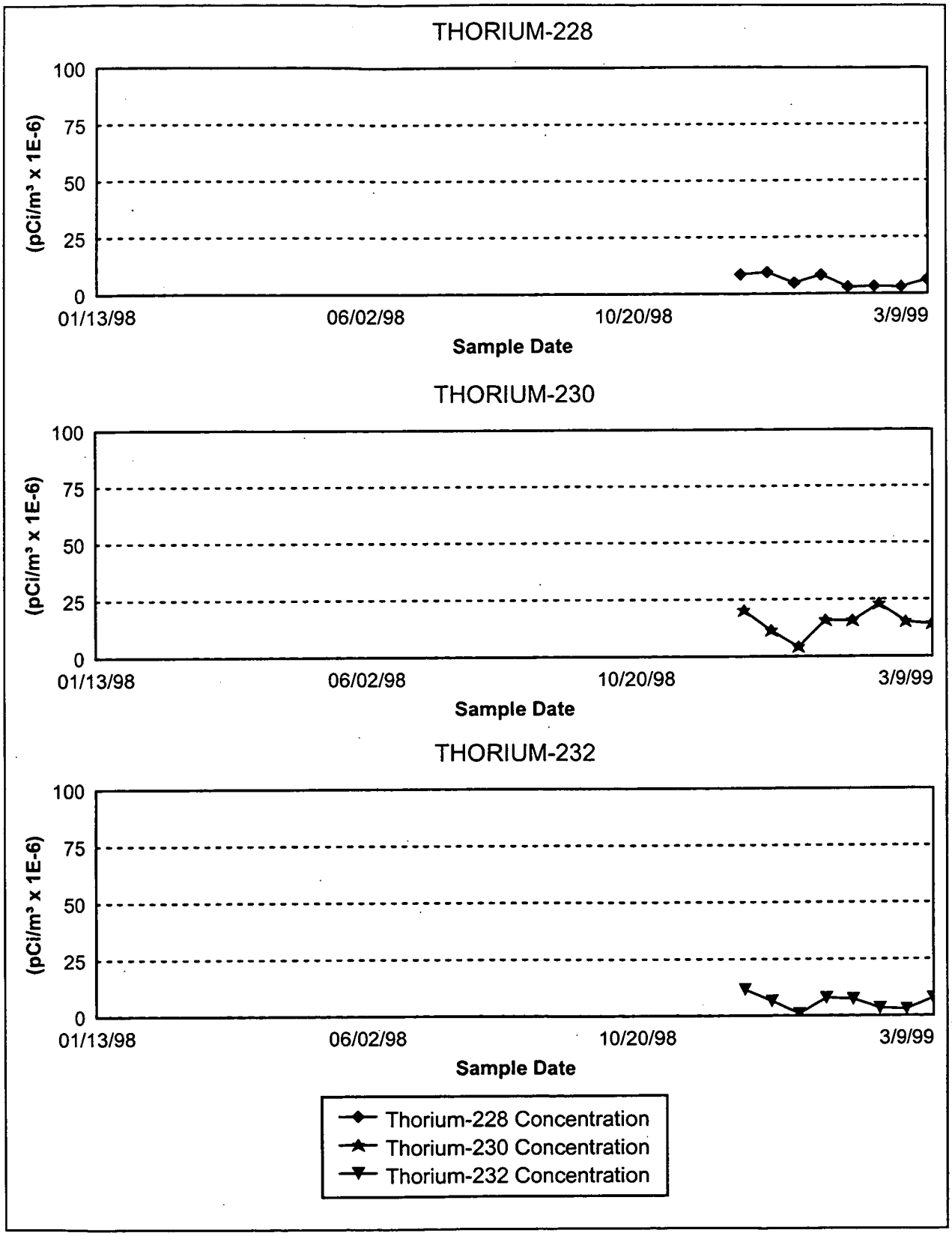


FIGURE 3-10. THORIUM-228, THORIUM-230, AND THORIUM-232 CONCENTRATIONS IN AIR (WPTH-1)

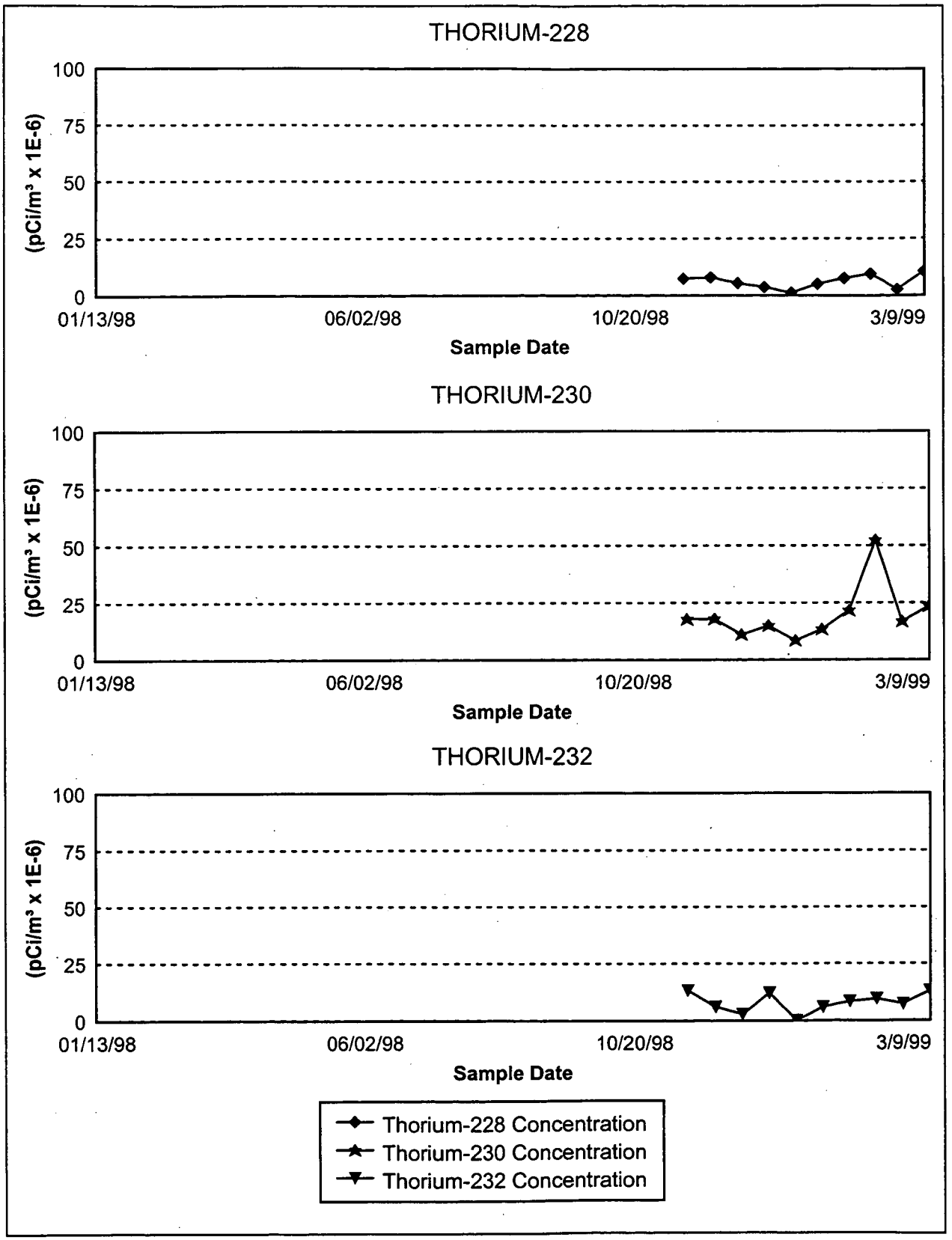


FIGURE 3-11. THORIUM-228, THORIUM-230, AND THORIUM-232 CONCENTRATIONS IN AIR (WPTH-2)

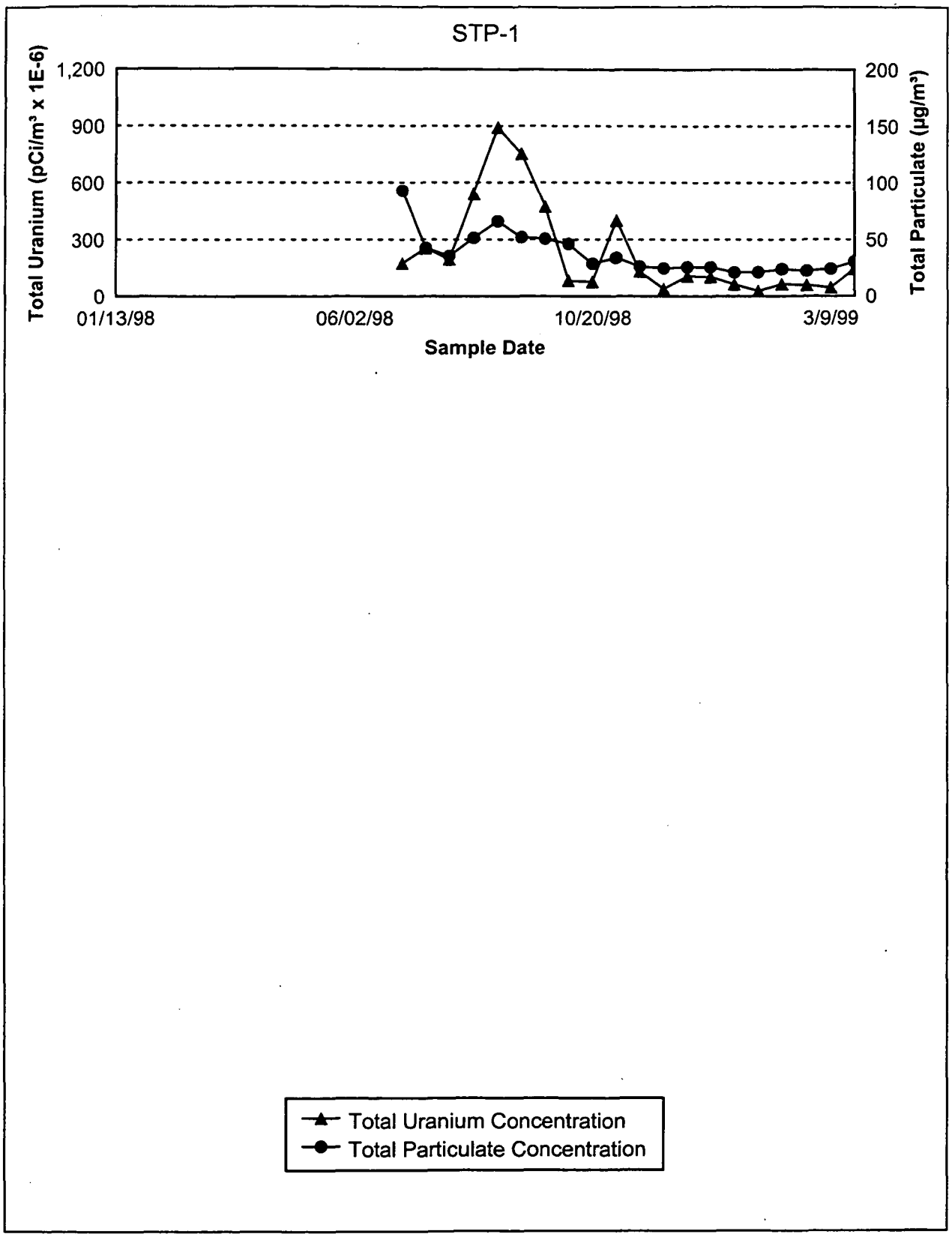
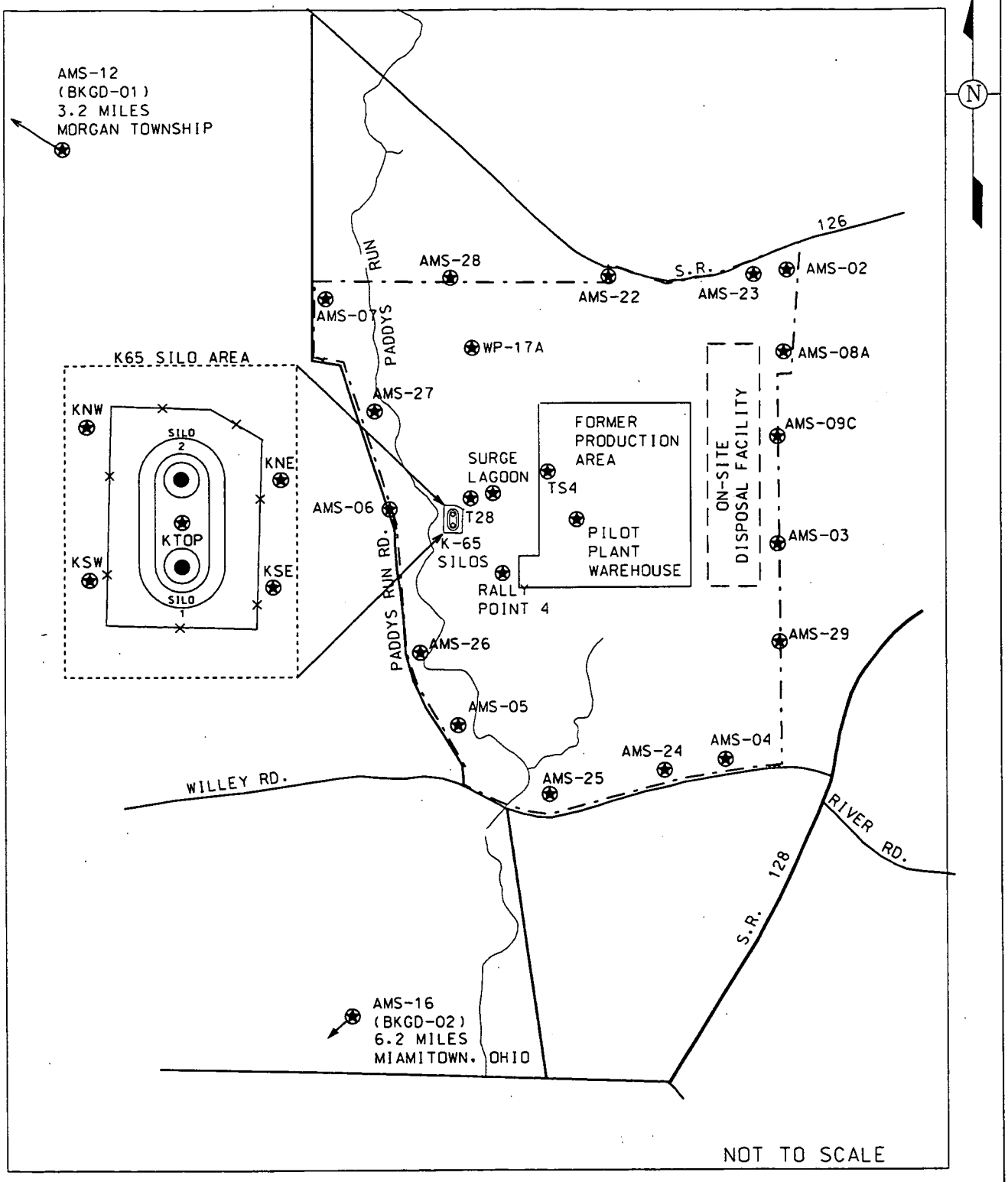


FIGURE 3-12. TOTAL URANIUM AND PARTICULATE CONCENTRATIONS IN AIR (STP-1)



LEGEND:

- FEMP BOUNDARY
- ENVIRONMENTAL RADON MONITORING - CONTINUOUS ALPHA SCINTILLATION LOCATION
- DISTANCE FROM CENTER OF FORMER PRODUCTION AREA TO LOCATION OFF MAP
- SILO HEAD SPACE RADON MONITORING - CONTINUOUS ALPHA SCINTILLATION LOCATION

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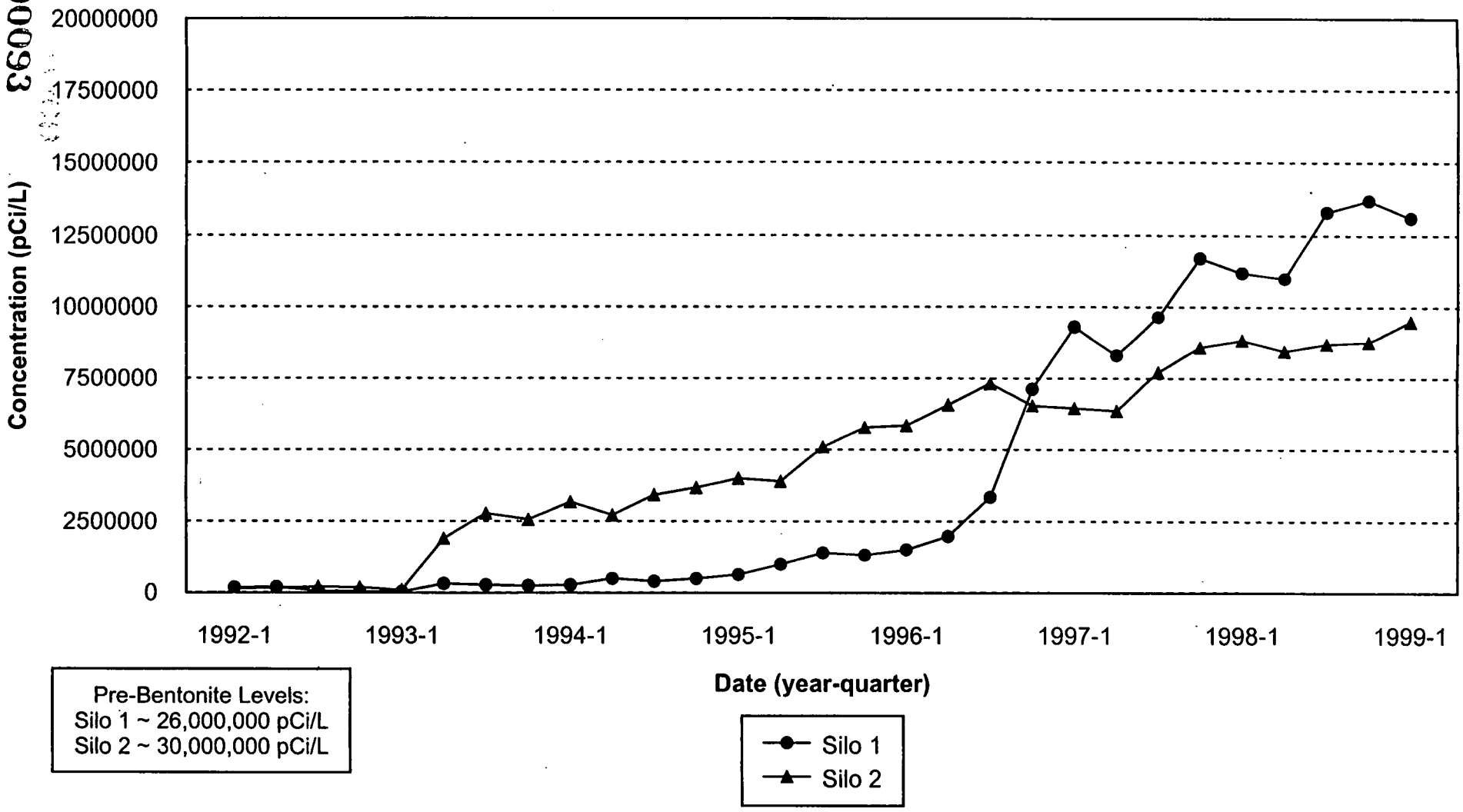
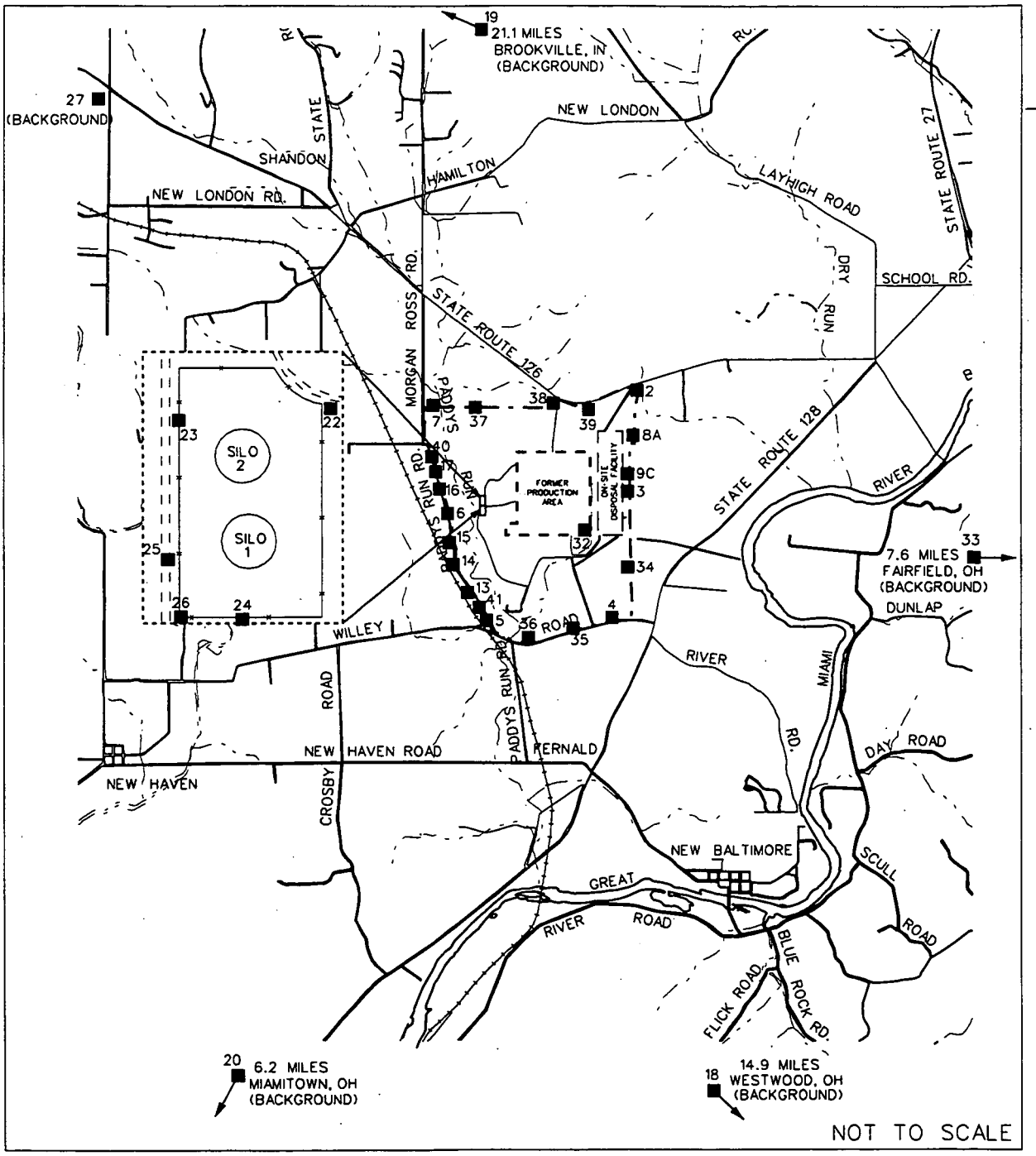
FIGURE 3-13. RADON MONITORING - CONTINUOUS ALPHA SCINTILLATION LOCATIONS



NOTE: Defective sample line for Silo 1 was replaced during fourth quarter 1996.

FIGURE 3-14. QUARTERLY K-65 SILO HEAD SPACE RADON CONCENTRATIONS, 1992-1999



LEGEND:

DISTANCE FROM CENTER OF FORMER PRODUCTION AREA TO SAMPLE LOCATIONS OFF MAP

FEMP BOUNDARY

DIRECT RADIATION (TLD) MONITORING LOCATION

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FIGURE 3-15. DIRECT RADIATION (THERMOLUMINESCENT DOSIMETER) MONITORING LOCATIONS

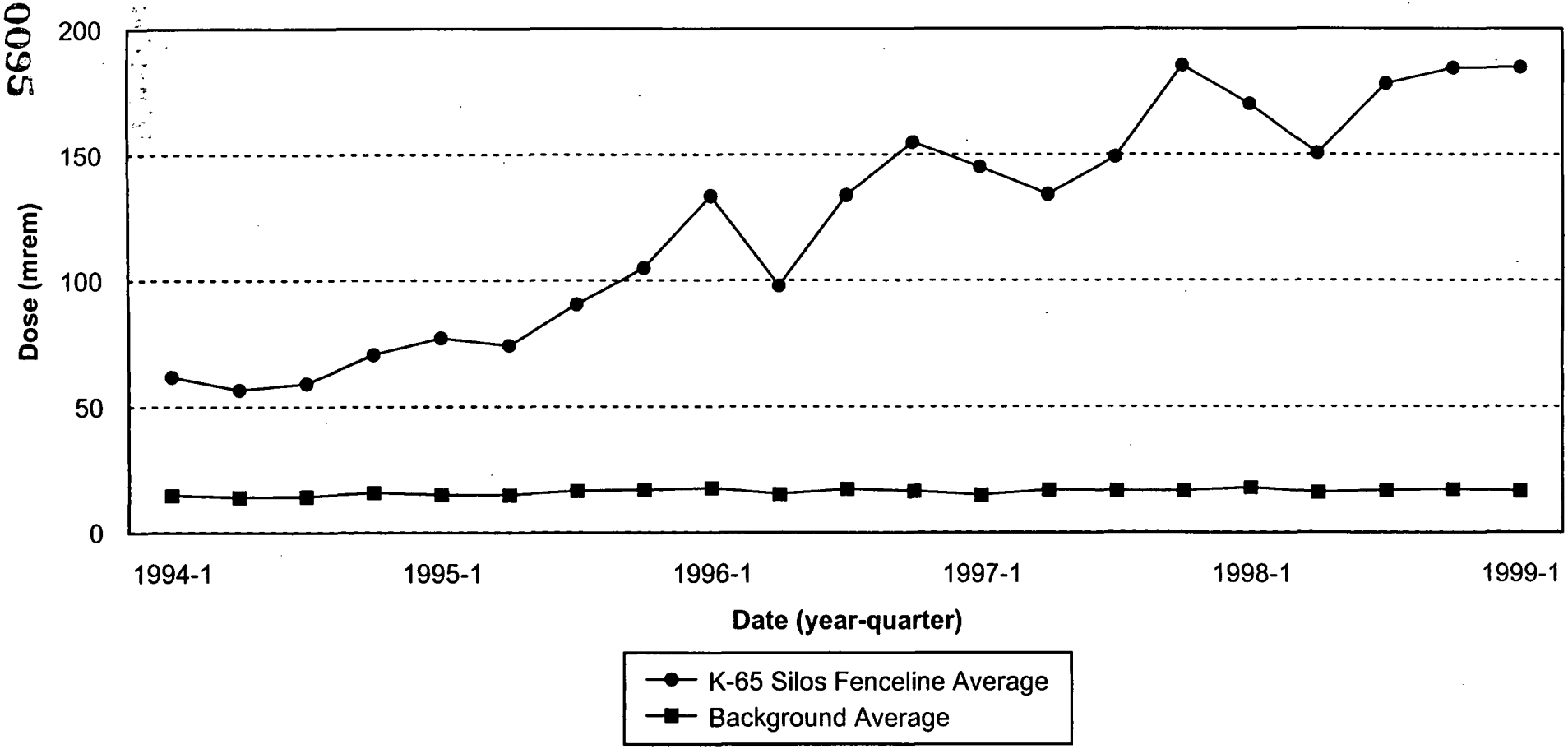
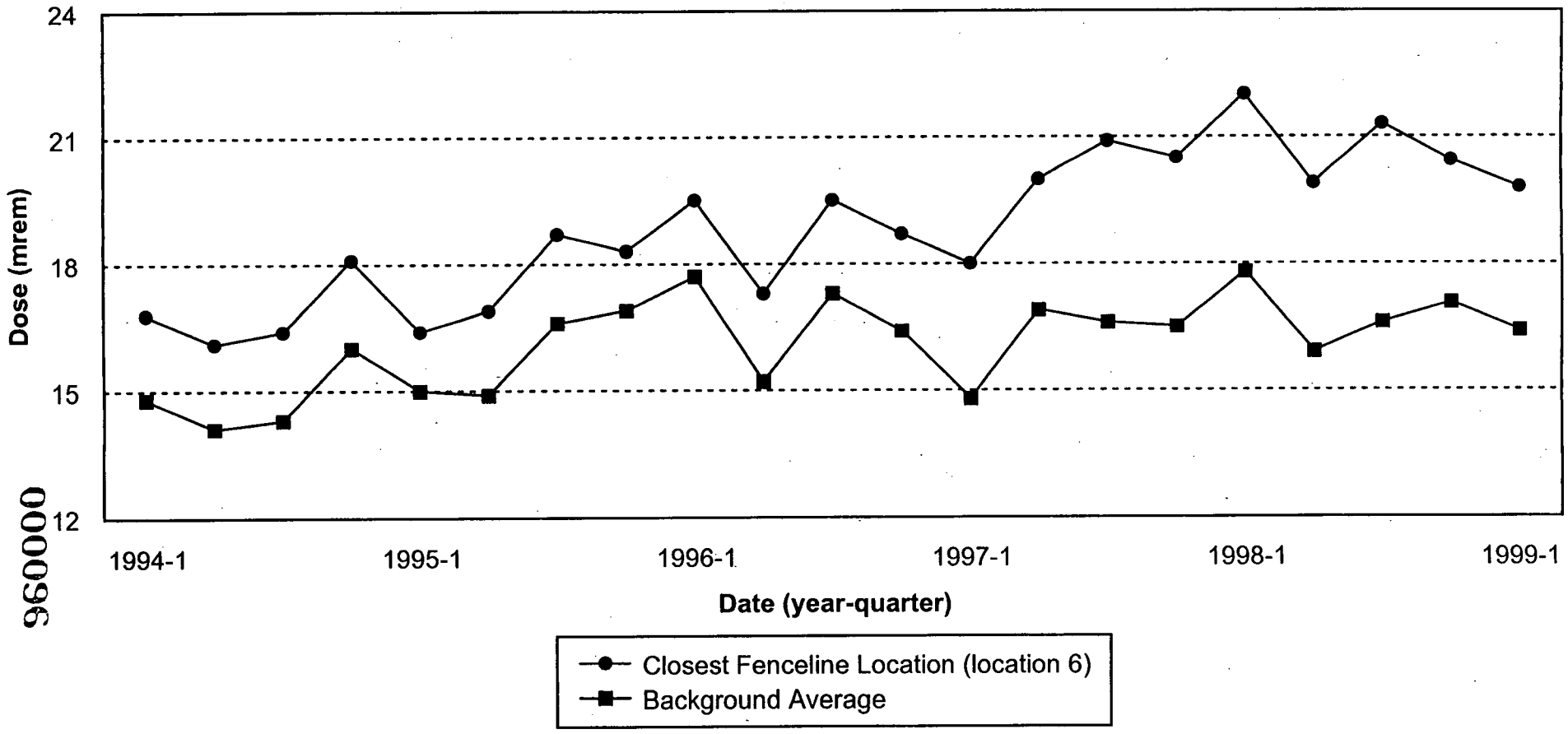


FIGURE 3-16. QUARTERLY DIRECT RADIATION (TLD) MEASUREMENTS, 1994-1999
(K-65 SILOS FENCELINE AVERAGE VERSUS BACKGROUND AVERAGE)



960000

FIGURE 3-17. QUARTERLY DIRECT RADIATION (TLD) MEASUREMENTS, 1994-1999
(LOCATION 6 VERSUS BACKGROUND AVERAGE)

2354

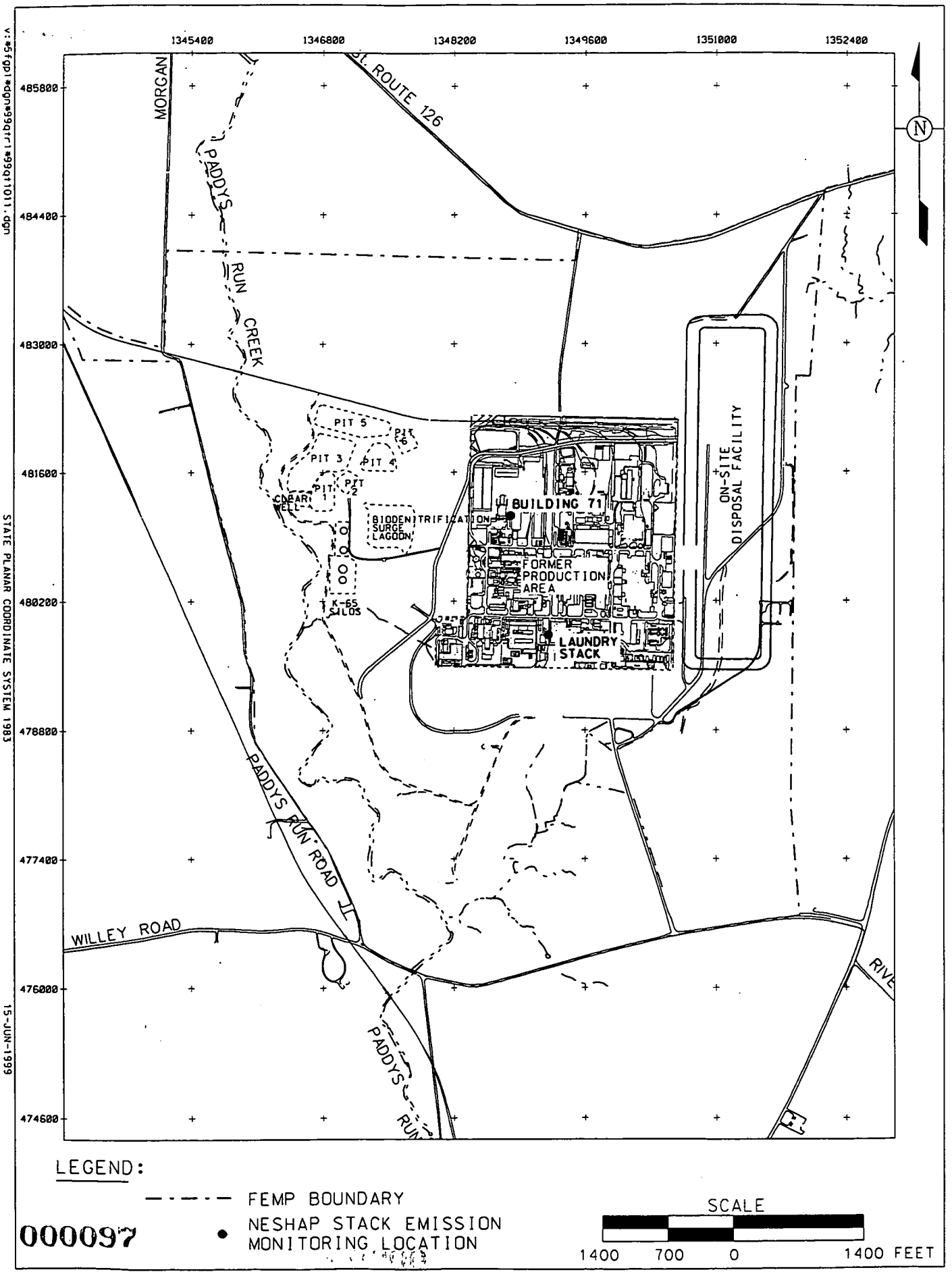


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FIGURE 3-18. NESHAP STACK EMISSION MONITORING LOCATIONS

FIGURE 3-19

AIR SAMPLING ACTIVITIES COVERED IN THE NEXT QUARTERLY REPORT

SAMPLING ACTIVITIES	1999											
	First Quarter			Second Quarter			Third Quarter			Fourth Quarter		
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Radiological Particulate Monitoring:				♦	♦	♦						
NESHAP Quarterly						♦						
Radon Monitoring - Continuous Alpha Scintillation Monitors				♦	♦	♦						
Direct Radiation (TLD) Monitoring						♦						
NESHAP Stack Emissions Monitoring				♦	♦	♦						

♦ Data summarized/ evaluated in the next report

4.0 NATURAL RESOURCES UPDATE

This section provides a summary of newly impacted or ecologically restored areas, as well as a status of wetlands and endangered species at the FEMP.

During the first quarter of 1999, there were no habitat impacts due to limited field activities during the winter months. However, several ecological restoration projects were initiated late in the first quarter in the following areas:

- Area 1, Phase I (wetland mitigation)
- Area 1, Phase III (invasive species control research)
- Area 8, Phase I (revegetation research).

These ecological restoration projects will be discussed in future IEMP quarterly status reports as they are completed.

Sloan's Crayfish monitoring continued during the first quarter of 1999 and no unexpected conditions were observed. Any increase in turbidity was a function of flow resulting from precipitation rather than from FEMP construction area runoff. Therefore, the FEMP had no impact on Sloan's Crayfish populations during the first quarter of 1999.

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